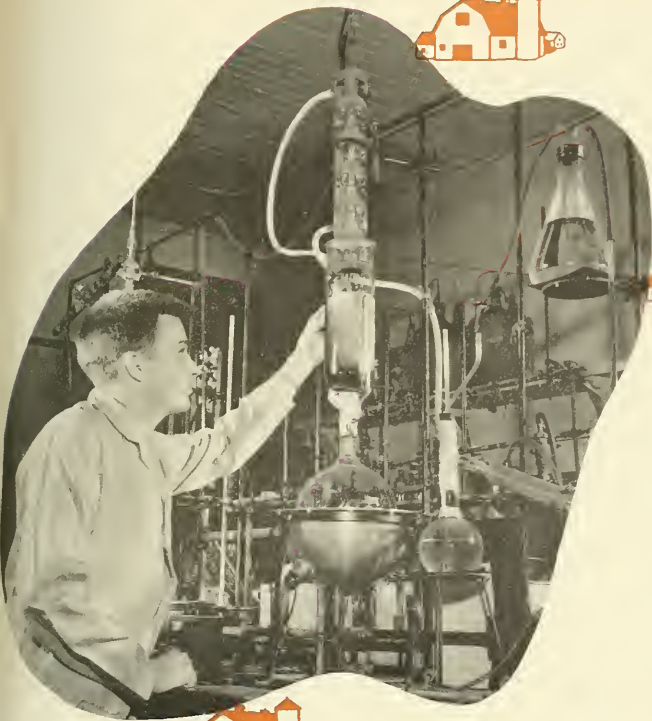


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Science Serves Your Farm



AGRICULTURAL EXPERIMENT STATION
WEST VIRGINIA UNIVERSITY





H. R. VARNEY, AGRICULTURAL EXPERIMENT STATION DIRECTOR

West Virginia University reports to West Virginia Farmers:

AGRICULTURE HAS CHANGED largely from a self sufficient basis to a commercial basis in the last 50 to 75 years. This means, in general, that products are produced in the areas and on the soils where they are best adapted. Competition is keen between the producers of each product and between producers from different areas. It is necessary to use the latest methods of planting, caring for, and harvesting crops, of pest controls, disease control, fertilization, and so on. If farmers in West Virginia do not have the most up-to-date information and methods, they are handicapped when competing with farmers from other areas.

Since farming is carried on, for the most part, in relatively small units, the individual farmer has neither the time, personnel, nor money to carry on necessary experiments and research work. Agriculture in this country has undergone a major revolution in the last 75 years, and most of this change can be traced to the research workers in our laboratories throughout the country. Passage of the Hatch Act in 1888, establishing agricultural experiment stations, paved the way for this tremendous increase in productivity, both per man and per acre. This increase has astounded the rest of the world, and its real capacity was most evident during the last war.

In this State, the Agricultural Experiment Station was established in 1888. A separate College of Agriculture in the University was established in 1897, and the Agricultural Experiment Station made a division of it. The Agricultural Extension Service was established in 1913.

If we are to have an up-to-date agricultural program in West Virginia, or the Nation, for that matter, research, resident instruction, and field instruction or extension work all are needed and must work hand in hand. We must have the research work as the basis for continued development of methods, practices, and improved strains and varieties. We must have the field instruction to take the results of this research work out to the producers in the form that can be easily used by them in their day-to-day operations. And we must have the resident instruction to provide a continuous stream of well trained young people for our farms, our marketing organizations, our experiment stations, and our extension services.

This report gives some of the results of the research work that has been carried on at the West Virginia Station. Our staff is constantly striving to find the answers to problems facing the farmers of the State in their day-to-day operations. We also are trying, in so far as possible, to anticipate some of the problems that will arise so that the answers may be available when needed. In order to develop and maintain an efficient, forward-looking research program, we need the cooperation and support of farm people all over the State. We welcome their suggestions.

Science Serves Your Farm

Biennial Report of H. R. Varney, Director
West Virginia University Agricultural Experiment Station
For the Period 1948-1950

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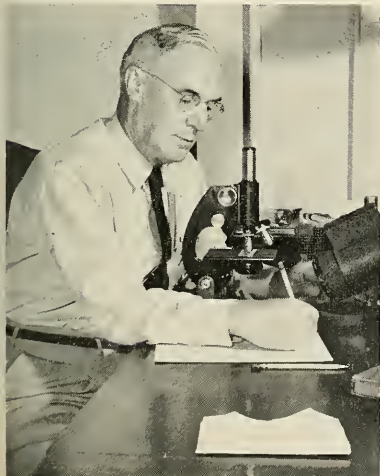
Dr. C. R. Orton resigned from his position as Director of the Agricultural Experiment Station during this biennium to return to teaching and research.

His ten-year tenure as Director was outstanding. It was one of expansion for the Station. Approximately 1,451 acres were added to the University's experimental farms, together with numerous buildings and much equipment.

Under Dr. Orton, Reymann Memorial Farms was completely reorganized in 1944 and now has become a key factor in the agricultural development of the Cacapon and South Branch valleys.

Dr. Orton also was responsible for many additions to the staff. These included specialists in new fields (hydrology, rural sociology, and hillculture) not previously recognized at the Station.

(Continued on Inside Back Cover)



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Bulletin 342, September 1950

Agricultural Experiment Station, H. R. Varney, Director
College of Agriculture, Forestry, and Home Economics
West Virginia University, Morgantown

PROJ



1 FARM PROBLEMS are often discussed in the field. Here a farmer, right, is telling a Station staff member about a problem that he discovered on his farm. The farmer told the researcher where and how he came to find this trouble. After making an examination of the field, the researcher will take a sample back to the laboratory for further investigation.

THE RESEARCH PROJECT is the unit of work for West Virginia University Agricultural Experiment Station. Various departments of the Station study farm problems known to exist in the field of agriculture, as well as problems that are brought in by Agricultural Extension workers from farmers around the state. Often one department will have complete supervision of a project. At other times, a problem will be worked out cooperatively among several departments. A project may last a year or ten years, or even longer. More than 100 projects are underway at the Station now.



2 PROJECT OUTLINE is drawn up and discussed by the department head and fellow workers. Members of other interested departments often are called in. Suggestions for improvements in outline are considered.

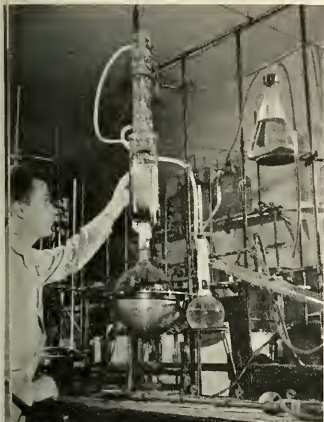


3 STATION DIRECTOR and Associate Director review the project outline (which has just been supplemented and revised by a departmental committee) with department head. They then determine whether funds are available for the work. If the project seems sound and can be financed, outline is passed on to the Station's Project Committee.

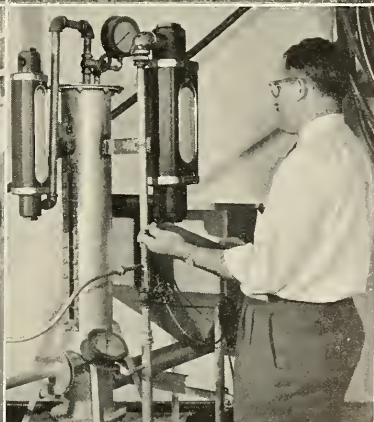
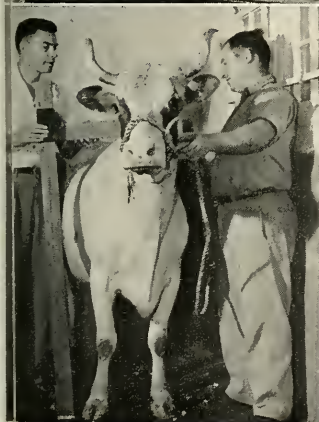
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4 PROJECT COMMITTEE, made up of experienced researchers from the Station staff, gives the proposed project a thorough investigation. The committee asks if the work will fit into the over-all Station program, if the project is set up so it will yield accurate results, and other questions. The committee then often makes changes in the outline before sending it back to the director with recommendations.



6 PUBLICATION of results is climax of project. Farmers and fellow workers must be told the story before the job is done. The material goes to Publications Office for editing.



5 PROJECT LEADER is now ready to start research. This data-collecting phase takes a variety of forms, depending on the type of project: it may consist of recording yield data on carefully laid out plots or production records on livestock on different feeds or different management programs; conducting laboratory research on cause and treatment of a disease; or house-to-house surveys.

7 BULLETINS are mailed to farmers in West Virginia and to research workers throughout the world. County Agricultural Agents use these to study experiments, advise farmers.

These station projects were active in the biennium 1948-50:

(Abbreviations for funds supporting projects: A—Adams; BJ—Bankhead-Jones; NE—Northeastern Region, Research and Marketing; NEM—Northeastern Region (marketing), Research and Marketing; RM—Research and Marketing; P—Purnell; SCS—Soil Conservation Service; S—State; USDA—United States Department of Agriculture.

Agricultural Biochemistry

Study of the pigmentation and ripening of fruit (A 3)
Isolation, purification and determination of some of the hemicellulose constituents found in the nitrogen-free extract of feeds and foods (A 12)
Factors needed to supplement rations for satisfactory growth, reproduction and lactation (BJ 51)
Ascorbic acid metabolism (BJ 48; coop. Home Economics)
Miscellaneous chemical investigations (S 5)
Study of the relative value for growth of the proteins of a number of feeds used in poultry rations (P 4; coop. Animal Husbandry)
Human nutritional status studies in W.Va. (RM 7 [NE 4]; coop. Home Economics)

Agricultural Economics

Broiler industry in northeastern W. Va. (BJ 40)
Harvesting hay in W.Va. (BJ 60; coop. Agr'l Engineering, Agronomy)
Practices, costs and returns in the production of agricultural products in W.Va. (BJ 52)
Effect of consumer choice on egg marketing (CE62; coop. USDA)
Seasonal milk production on W.Va. farms (P 48)
Some factors affecting the vitality of 4-H club work in W.Va. (P 52; coop. Agricultural Extension Division)
Marketing W.Va. apples and peaches (RM 1 [NEM 2])
Marketing W.Va. eggs (RM 2 [NEM 5])
Marketing economies and consumer benefits from an even milk production in W.Va. (RM 3 [NEM 1])
Inter-market price relationships for milk and dairy products in W.Va. (RM 17 [NEM 1])
Techniques for measuring consumers' choice (RM 25; coop. USDA)

Agricultural Engineering

Design and construction of hay hoists (CE 47)
Design and construction of a pasteurizer of commercial capacity for nut meats (CE 57; coop. Horticulture)
Study of the design and operating characteristics of a grain conveyor using fluidization principles (CE 63; coop. Engineering Experiment Station)
Demonstration of factors influencing the drying rates of grains (P 55; coop. Engineering Experiment Station)
Determination of housing needs and preference of farm families in W.Va. (RM 4 [NE 7]; coop. Home Economics)

Investigations to determine the optimum stall for dairy cows (RM 5 [NE 3])
To determine the most efficient and economical method of removing manure and litter from dairy barns (RM 6 [NE 3])
Design, construction and testing long hay blowers (RM 15)
Study of the design and operating characteristics of a barn baled hay drier using supplemental heat (RM 21; coop. W.Va. Board of Control)
Study of some of the factors involved in using supplemental irrigation in W.Va. pastures (RM 24; coop. Dairy Husbandry, Agronomy)

Agronomy and Genetics

Corn genetics and breeding (BJ 3)
Forest soil studies (BJ 9-I; coop. Plant Pathology)
Investigation of soil slips in W.Va. (BJ 15; coop. SCS and SRC)
Reclaiming eroded soils (BJ 17; coop. Forestry and SCS)
Effect of fertilizer treatments and cropping system on the yield and quality of tobacco (BJ 19; coop. USDA)
Breeding and improvement of pasture grasses and legumes (BJ 26; coop. Plant Pathology, USDA, Regional Pastures Laboratory)
Revegetation of strip-mined land in W.Va. (BJ 39; coop. Forestry and SCS)
Selection and breeding of superior strains of red clover for W.Va. (BJ 43)
Barley breeding and testing (BJ 54)
Variety testing (S 6)
Soil survey work in W.Va. (S 8)
Alfalfa investigations (S 10)
Crop rotation experiments (S 11)
Sweet clover investigations (S 13; coop. Agr'l Biochemistry)
Crop responses to various fertilizers (S 14)
Changes in condition following a mine sealing, tile draining, and surface treatment in soil acidized by run-off mine water (S 40)
Road-bank stabilization (S 50)
Killifer furrows in eroded black shale for run-off (S 58)
Characteristics of flow from a large spring (S 59)
Soil acidity and plant growth (P 2; coop. Agr'l Biochemistry)
Plant nutrient availability studies (P 29-I)
Studies on W.Va. pastures (P 30-I; coop. Dairy, Animal Husbandry, USDA)
Physical and chemical properties of selected soil profiles and the root development of vegetation commonly found on them in relation to infiltration and erosion (P 35; coop. Horticulture, SCS)
Plant nutrient availability studies—foliar nitrogen, phosphorus, and potassium interactions as influenced by fertilization and soil nutrient supplies (P 45)
Maintaining profitable stands of alfalfa (RM 10)
Effect of crop rotation and fertilizer treatments on the physical and chemical properties of Wheeling soil and the relationship of these properties to crop yield (RM 20; coop. SCS)
Weed control in corn (RM 22)
Forage crops varieties, strains, and species for W.Va. (RM 26 [NE 10]; coop. USDA)

Animal Husbandry

Effect of selection in cross breeding on broilers within certain heavy breeds of chickens (A 7)
Improving marketing value of turkeys by cross breeding (BJ 5)
Selection of breeders in relation to longevity of progeny in S. C. White Leghorns (BJ 13)
Study of the effect of method of storage of hay on its nutritive value for sheep and beef cattle (BJ 24; coop. Agr'l Biochemistry)
Immature grass and legume silages for chickens (BJ 36; coop. Agr'l Biochemistry, Agr'l Engineering)
Effects of thyroid stimulants and depressants on growth and fattening of swine (BJ 47)
Effect of heredity and environment on keel deformities in White Leghorns (BJ 53)
Effect of prophylactics and therapeutics for controlling coccidia in chickens (BJ 55)
Comparison of calcium supplements for poultry (S 51; coop. Agr'l Biochemistry)
Legume grass silage vs. corn silage for wintering beef cows (S 53; coop. Agr'l Biochemistry)
Study of the relative values for growth of the proteins of a number of feeds used in poultry rations (P 4; coop. Agr'l Biochemistry)
Silages for cattle and sheep (P 34; coop. Agr'l Biochemistry)
Causes of variability in apparent digestibility of feeds (P 36; coop. Agr'l Economics, Swift and Company)
Phenothiazine and salt mixture as an anthelmintic for gastro-intestinal parasites of ewes and lambs (P 38)
Methods of feeding growing pullets (P 39)
Comparison of native and western ewes for production and longevity (P 41)
Relation of birth weight within breeds to growth rate of purebred mutton type lambs (P 50)
Improving the reproduction performance of turkeys (RM 9)
Transmission and immunity of vaccine strains of Newcastle Disease in chicks following adult vaccination (RM 23 [NE 5])

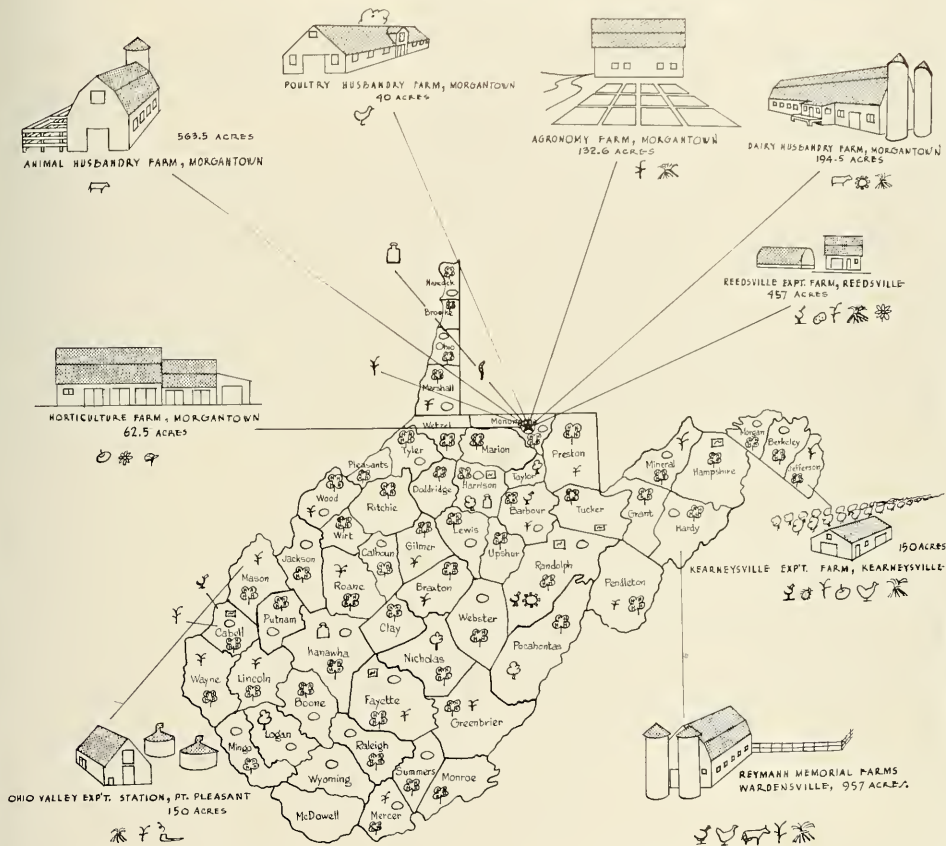
Dairy Husbandry

Use of type and production records as a basis for a dairy cattle improvement program (BJ 45; coop. Agr'l Economics)
Transmission of milk and butterfat production and body conformation by dairy sires (P 14; coop. USDA)
Keeping qualities of milk in home refrigerators (P 49)
Prepartum milking of dairy heifers (P 51; coop. Agr'l Biochemistry)
Some chemical and physical analyses of the blood of dairy cows (RM 8; [NE 1] coop. Animal Husbandry)
Breeding efficiency of dairy cows (BJ 42; coop. Animal Husbandry)
Feeding of thyroprotein to dairy cattle (BJ 38; coop. Agr'l Biochemistry, Animal Husbandry)

(Continued on Page 36)

W.V. U. AGRICULTURAL RESEARCH COVERED EVERY COUNTY

★ MORGANTOWN, AGRICULTURAL EXPERIMENT STATION HEADQUARTERS



- 🐾 ANIMAL DISEASES
LABORATORIES @ MORGANTOWN
- 🧪 BIOCHEMISTRY
LABORATORIES @ MORGANTOWN
- 🌽 CORN
- 🐄 DAIRY CATTLE
- 🥚 EGG MARKETING SURVEY
- ⚙️ ENGINEERING

- 🛤️ ERODED ROADBANKS
- 🌸 FLOWERS & SHRUBS
- 🌲 FORESTRY
- 👥 4-H CLUB SURVEY
- 🍏 FRUIT
- 🐛 INSECTS
- 🐄 LIVESTOCK

- 🐄 MILK MARKETING SURVEY
- 🌿 PLANT DISEASES
- 🐔 POULTRY
- 🥔 POTATOES
- 🌾 SMALL GRAINS & HAY
- 🚬 TOBACCO
- 🌱 VEGETABLES



SMALL GRAIN VARIETY TESTS ARE CONTINUALLY BEING MADE WITH OATS, WHEAT, AND BARLEY.

Better small grains for West Virginia

TESTING OF SPRING OAT varieties the last two years has uncovered a new variety which is well adapted for West Virginia. It has been named Andrew and was developed by the Minnesota Experiment Station.

Andrew is similar in appearance to Clinton, that is, short to medium in height. It is an early-maturing, open-panicked, yellow-grained oat with good standing ability. It has been found to be resistant to crown rust, smuts, and all prevalent races of stem rust except one—Race 8. Its high disease resistance has contributed to its excellent yielding ability. In our trials the last two years, Andrew has outyielded Clinton about 10 per cent. And Clinton is a superior oat.

SOFT WINTER WHEAT trials conducted during the last two seasons have given additional evidence that Thorne is the best available variety for West Virginia. Varieties other than Thorne that have given good results are Fairfield, Fullho, Nured,

and in some locations Vigo and Butler.

WINTER BARLEY varieties were tested primarily for winter-hardiness and yielding ability. Kentucky No. 1, a bearded variety that is on the recommended list, has continued to give high yields. Brier, a variety released by our Station, has given better performance. It is similar in appearance to Kentucky No. 1, but usually not as tall.

The Station has an unnamed selection that is superior in yielding ability. It is much like the two above varieties in appearance, but a little taller and later. Seed of this variety is being increased for release to seed growers. Wong, a variety popular in some sections of the state, has been found to lack sufficient winter-hardiness at the higher altitudes and in the colder parts of the state. Tucker is the best hooded-type barley for the state, but like Wong lacks winter-hardiness.

More research in small grains will be carried on by Blair Ritter.

Add nitrogen to wheat in spring

Adding nitrogen to your wheat in the spring may double yields.

That was the experience of D. R. Browning and G. C. Pohlman when they set up an experiment at the Ohio Valley Experiment Station.

The extra nitrogen was in addition to 500 pounds per acre of 5-10-10 fertilizer which was distributed over the area at seeding time.

Combat dry spells with irrigation

The Agricultural Engineering, Dairy, and Agronomy and Genetics staffs are getting a new project on irrigation underway. A complete portable sprinkler-type irrigation system has been designed by D. P. Brown and R. E. Emerson, and has been installed in an eight-acre field at the Dairy Farm.

O. J. Burger will keep records on caged areas. These records will be taken at each harvesting or grazing period.

For the past several years, prolonged dry periods during the summer have greatly reduced the carrying capacity of our West Virginia pastures. Only limited information is available on the use of supplemental irrigation on pasture, and

none of the data can be interpreted as applying strictly to West Virginia conditions. At the end of this study, it is hoped that recommendations can be made to farmers facing the problem of dry pastures.

Hybrids increase corn yields

For the past two years average corn yields in West Virginia have been at the all-time high of 44 bushels per acre. This is well above the national average.

Part of the credit for these substantial corn yield increases made during the past ten years rightfully belongs to the Station. The yields are partially due to the Station's corn breeding and testing program. Our program of developing hybrids also is continuing. We had a new experimental hybrid, W. Va. #1355, that first went into seed production in 1949. Thus far, it has made excellent records in tests in southeast central portions of the state.

Since satisfactory high yielding hybrids for the higher altitude regions with short growing seasons have not been available, breeding of this class of hybrids is now underway.

J. L. Cartledge, C. W. Neal, C. J. Cunningham, D. R. Browning, and B. M. Ritter have been doing much of the research on this subject.

Priming raises tobacco profits

Tests made at the Ohio Valley Experiment Station show that priming tobacco, although a laborious task, is one which yields a high return for the labor used.

D. R. Browning says that three experimental plots were used. One plot had no priming, another had one priming, and a third had two primings. The area with one priming produced the highest quality tobacco.

The price per pound where two primings were made was only slightly less than that for one priming and almost two cents per pound above that for unprimed tobacco.

Killifer furrows allow more water

The Station also has been conducting interesting work on killifer furrows. You may have seen some of these. They are an 18-21 inch scratch made by a tractor-drawn chisel-type plow. It is intended to break up hard pan or plow sole and so permit the ground to take in more water without "waterlogging."

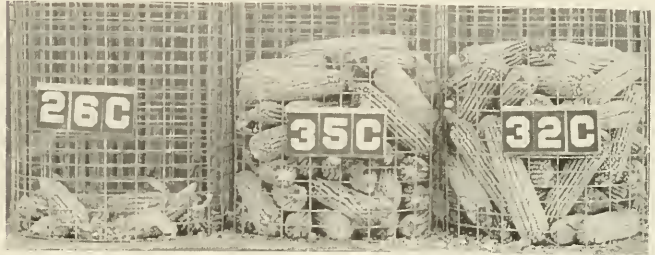
2,4-D has a place in corn weed control

EVEN THOUGH WEEDS in corn fields may be controlled by sprays, cultivation still seems to be beneficial, according to Collins Veatch.

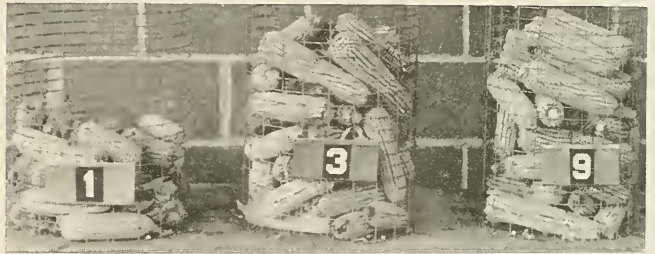
Weeds have been controlled in corn, and good crops have been produced by a pre-emergence spray with 2,4-D at the rate of two pounds of acid equivalent per acre. On the other hand, yields were not better than those from hoed or cultivated

plots. Although 2,4-D has its place in weed control, it is not a cure-all.

Veatch and D. R. Browning recommend a post-emergence spray of one-half pound of 2,4-D per acre of corn to control the broad-leaved weeds, followed by cultivation. The cultivation will help keep down any grass. The use of 2,4-D was also found practical in controlling weeds in small grains, pastures, and lawns.



COMPARE THE RESULTS of no cultivation with hoeing and pre-emergence spray. Plot 26C was the check that received no cultivation or spray; 35C, late pre-emergence spray with two pounds of isopropyl ester of 2,4-D; 32C, three cultivations.



NO TREATMENT WAS COMPARED with hoeing and post-emergence spray at Wardensville. Plot 1 had no cultivation or spray; Plot 3 was hoed; Plot 9 got a post-emergence spray of isopropyl ester of 2,4-D (one-fourth pound per acre).

S. L. Galpin and B. J. Patton selected two hillside areas on the Reymann Memorial Farms. One plot normally had thin and poor vegetation, the other had fair cover. Killifer furrows about 18 inches deep (depth limit with the power available) were run on the contour and variously spaced from seven to twenty-five feet in July 1948. The furrowed area was given lime and fertilizer treatments in several proportions on strips running with the slope and across the furrows. A generous mixture of grasses and legumes was seeded by hand over

the furrows, but not between them, in late August 1948.

Observation of vegetation during 1949 showed marked response to lime and fertilizer treatments, but no noticeable relation to the killifer furrows. The seeding of the furrows had little effect. Moisture determinations in August 1949, twelve hours after cessation of a three-day rain, showed notably less moisture at seven inch depth in soil and directly below the furrows than elsewhere. Apparently the furrows were permitting deeper drainage than normally took place on the slope.



BARE ROADBANK AT RIGHT WILL ERODE EASILY, BUT VEGETATION-COVERED BANK AT LEFT WILL HOLD.

Our trial plantings are holding roadbanks

BARE ROADBANKS not only are unsightly but they also continually erode and fill ditches along the road, making it necessary to clean them frequently.

For that reason, the Station started a project, in cooperation with the State Road Commission, to overcome this problem. Experimental plantings were made on roadbanks throughout the state in 1947. The banks were sloped, limed, fertilized, seeded, and mulched.

Since that time, we have been making careful observations on the survival of the various grasses and

legumes seeded. The grasses used included: red top, rye grass, orchard grass, brome grass, tall oat grass, timothy, reed canary grass, tall fescue, and weeping love grass. Legumes used included: sweet clover, alfalfa, birdsfoot trefoil, ladino clover, Korean lespedeza, and lespedeza sericea.

G. G. Pohlman and S. L. Galpin say that good cover was obtained from all combinations except in areas where mass slip movement occurred before the young seedlings became established. Adapted grasses and legumes should be used.

Kingwa heads soybean production

Kingwa continues to be the best forage soybean for northern West Virginia, according to our experimental work. For seed production, Mingo, Hawkeye, or Lincoln are at the head of the list.

Collins Veatch says that Kingwa and Scioto are good forage soybeans

for the southwestern section of the state. He also reports that Lincoln, Scioto, Mingo, and Hawkeye have given the best seed production.

Red clover is under study

Experiments with red clover are in progress. We are attempting to evaluate the effect of various management practices and insect con-

trol measures on seed production.

Hay yield trials have indicated that some local strains of red clover may produce as well as improved strains. For that reason, Collins Veatch is using locally grown strains as a source of breeding material in his clover improvement work.

Corn yields vary greatly

The average corn yields for 1948 and 1949 varied from a maximum of 111 bushels per acre to a minimum of 22.2 bushels per acre at our Ohio Valley substation.

The difference is certainly significant. Of course, crop rotation experiments and fertilizers were part of the reason. The value of manure is clearly indicated by the fact that 10 tons of manure applied once in the rotation for corn gave an average yield of 100.2 bushels per acre even where no fertilizer was used. This compares to 105 bushels per acre where 259 pounds per acre of 5-10-10 were applied in addition to manure. The importance of lime in forage production is shown by yields of 1.41 and 2.14 tons per acre

respectively for the unlimed and limed areas.

G. G. Pohlman and D. R. Browning have been working on this project.

Good forage crops grown in state

Timothy is still the best grass to grow with red clover, according to recent trials at the Station. Orchard grass tends to crowd out the red clover and it takes smooth brome too long to get established.

In other experiments on forage crops, Atlantic, a new variety of alfalfa, was found to be well adapted to West Virginia conditions. When alfalfa is grown in a short rotation, either northern grown Common or Grimm alfalfa should be sown—if Atlantic is not available.

A mixture of alfalfa and tall grass as a rule will outyield alfalfa alone for hay production, according to Collins Veatch. He says it doesn't make much difference whether timothy, orchard grass, brome grass, or tall fescue is sown with the alfalfa.

Lime important to alfalfa

It appears that alfalfa stands are longer lived on soils which have plenty of lime in the subsoil. This is indicated by early results in the research being done on the subject by N. M. Baughman, J. R. Webb, and F. W. Shaller.

They will be doing a lot more work on the problem. Through their investigation, they hope to find evidence that will enable farmers to plant alfalfa stands without having to worry about reseeding in a year or two.

Now we are trying plowing under part of the lime and fertilizer to see if that will help maintain the stand.

Methods for making sail tests

To determine the need of various soils for nitrogen and phosphorus, we have been making a study that should present us with the best methods for conducting such tests.

E. H. Tyner found that several laboratory methods would give rather reliable information as to whether or not a soil would respond to phosphate applications.

It was found that the need of soil for nitrogen fertilization could not be determined accurately by laboratory methods. Nitrogen content of corn leaves taken at the shooting stage was found to give much more reliable information than soil tests.

Make-or break-hay?

MANY FARMERS LIKE to cut their hay in the early stage of maturity. They prefer it cut then because it makes better feed. Unfortunately, some hay is not cut until too late for good feed. At least that is what we observed from samples of hay collected from farmers.

While conducting our experiment, we found that only one-fourth of the samples (mostly legumes) were cut in the early bloom stage. From the standpoint of quality feed, too many farmers—25 per cent of those contacted—cut their legumes in the seed stage. Now that is not hay.

It also was found that hay lost grade between cutting and storing. The more important factors causing this loss were length of field curing, rain, and handling methods.

Station staff members hasten to add that modern hay machinery does not guarantee hay quality. Look at the hay in the windrow (1) that is being picked up with the one-man baler. It is mostly stems. The baler did not make the hay poor feed. Neither did it make the hay good. The hay's quality was poor because too much was cut at one time; it was cut too late, and raked eight times after eight consecutive days of rain.

Modern equipment has the capacity for storing considerable hay each day, but it sometimes breaks down (2). Hay loaders attached to trucks (3) are used in harvesting. On the other hand, some farmers with small crews use a tractor buck rake (4). The tractor buck rake is quite adaptable to stacking hay in the field. When hay must be hauled great distances, it is often dumped raked (5) and loaded with a buck rake on the back of a truck.

Small hay acreages of most State farmers will not justify the newest, most expensive equipment. These farmers use various techniques to move hay to storage. Some stack hay in the field, moving it to the stack with a horse and rope (6).

As this study progresses, our researchers — G. E. Toben, W. W. Armentrout, G. G. Pohlman, A. D. Longhouse, and R. E. Emerson—say that it is apparent that no one method of making hay is best. Forget about your neighbor's method; try improving your own. Most likely you can.





MAKING INVESTIGATION TO SEE HOW MUCH ELECTRICITY IS NEEDED TO RUN FANS FOR DRIER.



PORTABLE HEATING UNIT is used with new batch type drier; produces enough heat to cause 20° rise in temperature.

Heater helps dry baled hay

WE ARE GETTING encouraging results in a hay drying study at the Medium Security Prison Farm at Huttonsville. The primary objective of this investigation is to secure data from a field installation that can be used in making recommendations to farmers who are interested in drying baled hay.

The location for the research was purposely selected in an area of high rainfall and damp foggy nights. Farmers in this territory have experienced considerable difficulty in making quality hay.

The batch-type drier of approximately 20 tons capacity is being used. A 500,000 BTU/hr. oil burning heater heats the output of a 20,000 c.f.m. fan. It provides an approximate 20-degree rise in temperature.

If the objectives of this project are attained and the results are comparable to what has been found in laboratory studies it will mean that farmers in this area of high humidity can retain approximately 80 per cent of the protein in their hay rather than the usual 40 per cent for field-cured hay.

More time and research are necessary before any conclusive results can be announced. They will come in time though.

D. P. Brown, E. R. Baker, Jr., A. D. Longhouse, C. M. Vaughan, and C. McClintic will continue this work.

How to divert mine waters

Acidization of pasture by overflow of mine waters has been observed and measured for a period of nine years by S. L. Galpin. He reports the following conclusions:

(1) Most of the damage to pasture vegetation can be avoided or corrected by carrying mine waters (if they are strongly acid) from mine outlet to stream level in closed tile drains.

(2) Common or soft "farm" tiles are not durable when used to carry acid waters. Vitrified "sewer pipe" will prove cheaper in the long run for such use.

(3) Pasture areas denuded by overflow of acid water recover quick-

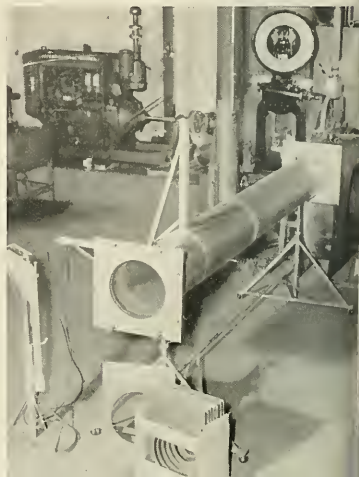
Blow hay into mows

BLOWING LONG HAY into the mow is still relatively new and used but little outside of New York State where the method originated. Economists, however, have shown that it is one of the cheapest means of putting up hay.

For this reason, A. D. Longhouse and R. E. Emerson are trying to improve the mechanical efficiency of these blowers. At present it's only 15-35 per cent.

By next year some results may be available on this work.

MECHANICAL EFFICIENCY is the keynote of this hay blower study. This fan (arrow) is 35 per cent efficient.





BLACK LOCUST, SHORTLEAF PINE, AND PITCH PINE GROW WELL ON STRIP MINE SPOIL BANKS.

ly after overflow has been corrected if lime and fertilizer are applied.

(4) While satisfactory revegetation may result from lowering the zone of high soil acidity one foot, best results probably can be obtained when tile conduits are laid at least three feet below the surface.

Damaging soil slips

Excessive rain (12-20 inches in 24 hours) promoted several large slips and earth floes on well wooded mountain slopes in the Smoke Hole Community, June 1949. Entry of these floes, as moving dams, into the swollen waters of the South Branch and North Fork created flood waves with crests reportedly three or four feet above general flood level. Much of the flood damage above Petersburg can be attributed to these mountain side slips.

S. L. Galpin is working on a report on these floes.

Drying rates of grains

E. R. Baker is taking on a new project entitled "Determination of Factors Influencing the Drying Rates of Grains."

Here are his objectives: (1) to determine the limitations on removing moisture from grains; (2) to determine critical temperatures, humidities, air volumes, air velocities, and

New life for strip mine spoil banks

OUR STRIP MINE reclamation project is continuing successfully. Grasses and legumes established at the Canyon, Arthurdale, and Richardson experimental plots in 1944 look good. Birdsfoot trefoil, alsike clover, and Korean lespedeza are showing up particularly well on moderately acid soils. E. H. Tyner and S. L. Galpin say that the same legumes plus sweet clover have done well on the less acid to neutral soils.

Several species of trees set out on

spoil banks under the guidance of E. H. Tryon are doing especially well. In fact black locust, which is making the best growth, is doing better on spoil banks than in adjacent fields. Shortleaf pine and pitch pine also are showing good growth. Norway spruce, black walnut, white pine, and the oaks and cherry are making poor growth.

The failure of the oaks and cherry, however, has been due mainly to damage by rodents.

time factors; (3) to determine the effects that drying conditions have on germination; and (4) to determine drying constants for various grains.

Microbial activity in spoil banks

Increasing interest in reclamation of strip mine spoil banks has turned attention to microbiology of the banks. Within the last year, H. A. Wilson has begun determining the number of bacteria, fungi, and streptomycetes of these areas.

Wherever spoil banks have received fertilizer, and lime if needed, and then seeded to grasses and legumes, the numbers of microorgan-

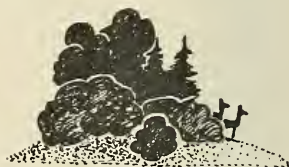
isms are always greater than in adjacent nonvegetated areas.

It also has been found that vegetated spoil banks, if recently seeded, contain smaller numbers of bacteria, fungi, and streptomycetes than nearby areas which have never been stripped.

Radioactive fertilizers—effect

Radioactive fertilizer materials have little, if any, effect on yields of corn and wheat. That is the finding of D. R. Browning and G. G. Pohlman. They conducted the experiment in cooperation with the Bureau of Plant Industry, Soil and Agricultural Engineering, U. S. Department of Agriculture.

THE FOREST WORLD



Mobile sawmill—farmer's helper

The Station-developed sawmill certainly has been used to advantage by the farmers of West Virginia during the past two years. Possibly some of you have had timber cut by this machine.

It has proved that it can do a good sawing job. It also saves money for the farmer who wants a small quantity of lumber sawed from logs cut in his own wood lot.

During one twelve-month period the mill completed 26 operations, several of which included more than one set. The total amount sawed during that year was 525,806 board feet, or an average of 20,224 board feet per operation. The smallest job was 7,890 board feet and the largest was 70,734 board feet. The average cost for the service was \$18.33 per thousand.

The unit was designed and built to handle small lots of timber which could not be handled economically by existing portable or permanent sawmills, and for operations which do not attract existing mills because of cutting restrictions.

A technical forester, who is also an experienced sawmill manager, directly supervises mill operations.

J. B. Byers and W. C. Percival have had charge of this project.

Timber vs pasture

The idea that when virgin stands of timber are cut there will be no more timber for a generation is



BLAZE (ARROW) INDICATES the tree is to be cut. Note good timber-cutting practices being used. Modern equipment facilitates cutting.

Proper management helps produce mine props at a profit

AN OPTIMISTIC VIEWPOINT is held by Torkel Holsoe and Glenn Longacre on the problem of managing timberlands for mine-timber production.

Some of you are no doubt familiar with the old, fire-scarred beech in southern West Virginia and have seen young oak stands being cut off completely so that the young, fast-growing trees can be used for mine props. Even though they may be cause for concern, Holsoe and Longacre think the problem will be solved in the future.

They have found that many an old beech stand can be cut economically and the hollow logs sawed into

mine timbers, blocks, and wedges, and still leave a fair profit to the owner. Besides this, they have found also that where beech and other old, wide-spreading trees are logged, yellowpoplar will come up and form a good stand.

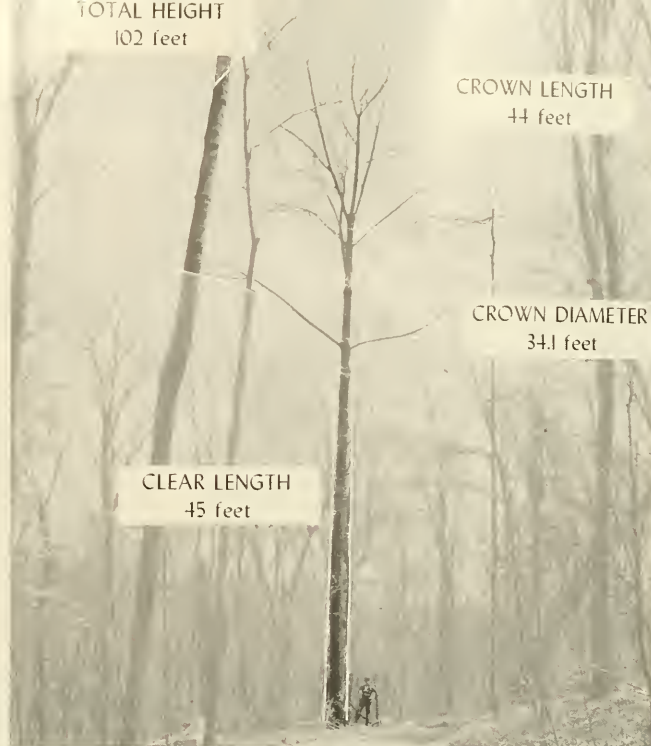
Furthermore, by making accurate cost studies of cutting operations, they have found that it is possible to thin out the dense young oak stands and thereby produce mine props at a profit. By thinning these stands there will be not only more and better props left for cutting in the future but there also will be valuable saw timber available in not so many years.

TOTAL HEIGHT
102 feet

CROWN LENGTH
44 feet

CROWN DIAMETER
34.1 feet

CLEAR LENGTH
45 feet



IT PAYS TO THIN OUT a stand; expansion of crowns pays off in profits.

being disproven almost every day. On many areas where trees are cut off a vigorous stand of young hardwoods will get established in short time, and the trees will grow rapidly.

In order to find out how much timber it is possible to produce in the different hardwood stands in West Virginia, Torkel Holsoe has established permanent sample plots in many of the forest types found in the state.

For the purpose of finding out how fast these areas can produce timber, the sample plots are thinned out at regular intervals. The material cut can be used for props and pulpwood which means that the operations can be done profitably.

In view of results already obtained, Holsoe believes that it will be possible to maintain a production of 600 board feet per acre per year throughout the largest part of growth of the stand. The current market price for such timber is \$15 per thousand board feet where the stands are accessible. This means that stands of this kind will produce about \$9 per year. Compared with pasture rental, which in many places in West Virginia amounts to about seven or eight dollars per acre, it truly can be said that such timber production "ain't hay."

What to plant on dry soil

A number of tree seedlings set out in dry soil at Greenland Gap are coming along well. Shortleaf pine, loblolly pine, red pine, and black locust have been established successfully.

This area in the eastern panhandle is characterized by low rainfall and dry soils of a shale origin which often make plant establishment difficult.

In spite of the dry soil during the planting season, green ash and catalpa also have survived well but growth has been poor. On the other hand, several varieties of hybrid poplars (including some developed for dry sites) have been tried but all are failures.

Fire-eaten woodlots need help

W. C. Percival, Clifford Myers, Allen W. Goodspeed, and other members of the forestry staff are seeking the answer to the question: How shall we handle the woodlots that in the past have been heavily cut and frequently burned?

Foresters find best way to develop trees for high returns

SOME OF YOU who are interested in your woodlands will sooner or later face the question: What kind of tree should I try to develop through forest management?

This is the question that Torkel Holsoe has been investigating.

Here are his findings:

1. It pays to thin out the trees so that they can expand their crowns as much as possible—as soon as they have clear stem length and dead branches covering two 16-foot logs.

2. By running logs from sample trees through a sawmill, it was found that the logs which had live

branches sawed out better quality lumber than the logs on which the branches had recently fallen off.

This study also has shown that a yellowpoplar tree which is 20 inches in diameter and grows at a normal rate of about three inches on the diameter in ten years will produce at a compound interest rate of 6.2 per cent. In other words, such trees are producing more money for the owner than most securities will. Not until the growth of the trees falls below an interest rate obtainable through securities should the trees be cut.

Experimental plots have been established in a 20-year-old mixed oak stand at the Cooper's Rock Experimental Forest. On these plots different management methods will be used to produce timber stands. Records of costs and returns are being kept for each plot. As data build up and are analyzed, we will be able to make better recommendations on

how to handle similar hardwood forests for the most profitable sustained yield of timber.

We are extending this work to other important forest cover types.

New adhesive test methods

The question of "What makes glue stick?" has always been one of

(Continued on Page 22)

GARDEN AND ORCHARD



Lilies

NEW HYBRID LILY contains characteristics of both lilies shown at right. It has auratum's larger size—about two or three times that of speciosum—has latter's beautiful coloring with added red or pink spotting. Petals are flat much like auratum's.



AURATUM is 10 to 12 inches, tip to tip. **SPECIOSUM** has white to pink coloring.

THE NEW HYBRID lily shown on this page, along with its parents, was bred at USDA greenhouses in Washington, D.C.; but the flower was first seen in West Virginia.

As a follow-up to the work being done here at the Station by O. M. Neal, Jr., and Samuel Ensweller, and at USDA, a number of seedlings are being sent to growers for further trials.

Although lily bulbs are not grown commercially in West Virginia at present, it appears that areas in the state may be suited to their production. Plants have made excellent growth at different elevations. Of some twenty odd species planted, all have survived and most have in-

creased rapidly. It is felt that cool summers with fairly high humidity and ample rainfall found at elevations above 1,500 feet are important for the growth and production of lilies.

Eliminate labor with sprays

All of you who grow small fruits are interested in decreasing the amount of back-bending labor that must be done. And so is W. H. Childs. He has spent many hours seeking the answer to this problem.

With the increased use of weed-killers and caustic sprays, he seems to think that there is considerable hope that some of this tedious work can be eliminated. During the past

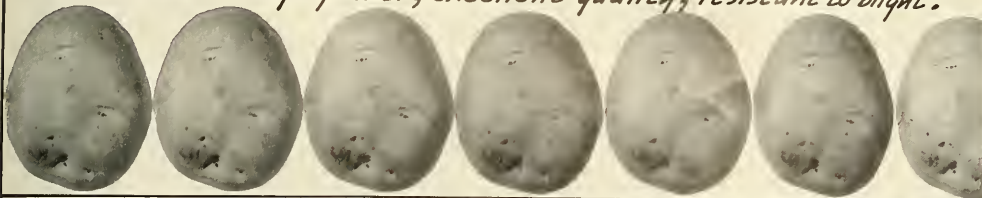
biennium three exploratory experiments were carried on.

In an attempt to control weeds, 2,4-D at the rate of one, one and one-half, and two pounds per acre in 200 gallons of spray was sprayed on newly-set strawberry plants. Ragweed, wild lettuce, shepherd's purse, Spanish needle, and lamb's quarters were killed. Dock, smartweed, and chickweed were injured. The strawberry plants were distorted somewhat but recovered rapidly. A heavy growth of grass in the plots prevented obtaining records of the effect of 2,4-D on runner production and yields. There seems to be much promise, however, for using 2,4-D on non-grassy sites.

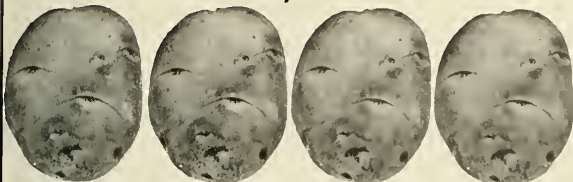
STORIES FROM OUR POTATO TRIALS

(EACH POTATO REPRESENTS 100 BU. YIELD)

KENNEBEC *high yielder, excellent quality, resistant to blight.*



RURAL *susceptible to disease, natural discoloration, passing out.*



COBBLER *most widely adapted early variety, a good keeper.*



We wondered if we might be able to destroy the bloom on strawberries the first season without injury to the plants by using caustic sprays or hormones. Several treatments were used, but none were as good as hand-picking of blooms.

Plots of currants, gooseberries, black raspberries, and red raspberries were sprayed with three strengths of 2,4-D, three strengths of Dow General Weed Killer, and four strengths of sodium trichloroacetate. All were quite weedy and grassy. None of the 2,4-D treatments were satisfactory. The Dow General Weed Killer killed grasses and weeds at all strengths used, and seemed to be noninjurious to the plants if kept off the foliage. Sodium trichloroacetate killed the grasses satisfactorily, but was injurious to the small fruit plants involved. The 50-pound-per-acre application caused rather light injury to currants and gooseberries, and might be feasible.

Better potato varieties replace old names

IN WEST VIRGINIA, late blight is unquestionably the most destructive disease of potatoes. If it can be controlled, more progressive work in the development of potatoes can be done.

The environmental conditions of the state such as heavy fogs and dews coupled with the cooler temperatures associated with the higher altitudes are extremely favorable for its development.

The new varieties that show promise are "carried" until they can be satisfactorily evaluated. Seedling stocks with desirable characteristics also are isolated to further the breeding program.

Our departments of Plant Pathology and Horticulture are currently screening many seedstocks and newly named varieties received from other cooperating stations.

A great many varieties are continually being tried at the Station. The only old variety to remain in general usage in the state is the Cobbler (early). Replacing the old Rural and Green Mountain, which were susceptible to many of the serious diseases, are the Katahdin, which is resistant to some of the virus diseases; the Sebago, also resistant to certain virus diseases as well as some of the soil rots; Menominee, which does not take scab under ordinary conditions; Chipewa, a midseason variety carrying virus resistance; and more recently Kennebec, a medium-late variety of excellent quality and of especially high-yielding capacity and highly resistant to late blight.

This study will be continued by J. G. Leach, M. E. Gallegly, and K. C. Westover.

Potatoes: Yields, fertilization

Potato studies have been the main concern of K. C. Westover.

In one, he has used whole, small potato sets and cut potato sets of the same size in trying to determine their relative effects on stand and yield. The Cobbler (early) and Sebago (late) varieties were used, and other than the type of tuber set the same conditions prevailed.

Whole sets produced the best stands, particularly so with the late variety. The yield differences were for the most part small and of little significance.

Depending on growing conditions, the whole sets generally yielded more in the case of the early variety, and the cut sets more in the case of the late variety.

Westover also has been comparing methods of fertilizer application. Three types were studied: the bandwise application by the planting machine, in which the fertilizer is distributed in two bands to the sides and a little below the seed piece; the incorporation of the fertilizer by hand in the potato drill or trench before planting; and the crossband application by hand after the sets were placed in the drill.

THE BANDWISE METHOD is the generally accepted method of the commercial grower and is considered most efficient and economical. The incorporation of the fertilizer in the drill is the general practice of the gardener but unless there is a thorough mixing of the soil and fertilizer the young sprouts and plants may be injured. The hand application of fertilizer in short bands across the row and between the sets offered a possibility to the home gardener of deriving some of the efficiency of the proven bandwise method. It also avoids the hazard of sprout and plant injury which results in lower yields often attributed to row application. These methods were used on both Cobbler (early) and Sebago (late) varieties.

EXPERIMENTATION points to small yield differences. The bandwise application tended to yield most, while the crossband application compared favorably and usually outyielded the row application. The latter hand method entails no special equipment and required less labor.

Another of Westover's experiments was on the effect of potato top removal on yield. Cobbler and

THE SAME APPLE SEEDLING--



STARKING ON JONATHAN SEEDLINGS is an excellent producer. It is not too growthy. Easy to harvest, spray. Bears early. Jonathan seedlings are the best.

AN ATTEMPT is being made to develop better apple trees. R. H. Suds, A. H. Thompson, and R. S. Marsh are doing the work.

They selected four leading varieties of apples in West Virginia for testing on 18 rootstocks. Types chosen included Gallia Beauty (Rome type), Starking (red sport of Delicious), Staymared (red sport of Stayman Wine-sap), and York Imperial.

The best combinations, based on yields, to come out of this research were Gallia Beauty on McIntosh seedlings, Staymared on Northern Spy seedlings,

Sebago varieties were used in this one too.

When the plants were in full bloom, the tops of plants in similar groups of random plots were removed at definite time intervals until harvest time. It was found that Cobblers made almost the entire crop in the first 100 days and that Sebagos required about 115 days.

THESE STUDIES SUGGEST that inefficient pest control during the first 115 days after the crop is planted is decidedly uneconomical. Continued care after this time is also of little advantage. And the use of potato top killers at the end of this period would (a) eradicate vines, large weeds, and fall grasses, and in

so doing permit the soils to dry more readily in preparation for harvest; (b) allow ample time for the crop to cure properly in the soil and thus reduce feathering (scuffing of potato skin) and mechanical injury during the harvesting operation; (c) probably reduce infection of exposed tubers which might later be the source of losses from ground rots; and (d) afford opportunity for the early seeding and establishment of the succeeding fall crop.

Potassium, phosphorus not needed

The bulk of our experimental evidence indicates that additions of potassium and phosphorus are not generally needed for apple orchards,

ON A DIFFERENT ROOTSTOCK



STARKING ON MCINTOSH SEEDLINGS is potentially an excellent producer but it is not now as good as the Jonathan shown at left. Vigorous, dense growth.

York Imperial on the 317 clon, and Starking on East Malling XV clon.

Unfortunately, the present supply of apple trees from nurseries is grafted on Delicious and Winesap seedlings. These have given some of the lowest yields in our rootstock work. Jonathan seedlings are much better.

It is possible that some day a rootstock will be made available that will provide trees of intermediate size, hardy, long-lived, resistant to diseases, insects, and rodents, and trees that will come into production early, with heavy annual yields. But research with rootstocks does take time.

except indirectly for the production of better cover crops and sods.

Since this is true, it would be uneconomical for the apple grower to use complete fertilizers, according to the report of G. G. Pohlman, A. H. Thompson, R. S. Marsh, and R. H. Suds. A grower who uses a complete fertilizer, such as 10-6-4 or 5-10-10, to supply the same amount of nitrogen as would 200 pounds of ammonium nitrate will find such applications costing him \$10 to \$22 more per acre.

In view of high production costs it would be inadvisable to spend the extra money for a complete fertilizer unless it was necessary for the orchard cover.

Frost protectors not recommended

Infra red Michigan radiation frost protectors cannot be recommended to orchardists. The cost is too high. R. S. Marsh says that they provide five to six degrees protection within an 80-foot radius, but that is not enough to offset the cost for each unit—\$350. Money invested in a relatively frost-free site remains the most economical method for frost prevention.

Marsh also had a small project on the use of a Vinyl resin emulsion. This emulsion, in combination with a starter solution on transplants, did not increase the early production of field-grown Break-O-Day tomatoes. The starter solution gave increased

early yields on the check plots, but climatic conditions were favorable for transplanting at the time of the experiment.

Do high quality apples pay?

Does it pay the grower to market high quality apples? This is a question on which there is a lot of opinion but little proof. One of the important factors causing lowered quality of apples is bruising. Costs of producing and marketing apples must be met, if met at all, out of the money paid by consumers. It is necessary, therefore, to learn what difference in value the consumer sees in bruise free apples in comparison with those that are rather badly bruised.

For the past two years, W. W. Armentrout has been seeking the answer to this question. No convincing evidence has been obtained yet.

Fruit varieties show promise

Among small fruit varieties tested in 1948 and 1949, a few strawberries show some promise. Both Fairlands and Vermilion (an Illinois cross which soon will be introduced) showed complete or almost complete immunity to the red stele disease. W. H. Childs and R. S. Marsh say that both were attractive and above average in quality but the trial planting was too small to give an accurate picture of yields. More tests are to come.

Fairpeake showed considerable promise as a high-quality, late variety; and Tennessee Beauty was above average as a midseason variety. In lighter soils the Robinson strawberry has made excellent yields as observed in various county Agricultural Extension demonstration trials.

Where *Bacterium pruni* is not a limiting factor, the Sunhigh peach is further proving its adaptability to our orchards in West Virginia. You also might be interested in knowing that Jerseyland looked promising in its first crop at the Kearneysville substation.

The Reber strain of Montmorency (sold as Richmorency) cherry continues to be outstanding. And giant types of Red Delicious and Jonathan apples were found in orchards near Chester and Martinsburg; they were sent to Geneva, New York, for cytological observations.

Vegetable varieties summary

Here's a brief account of the vegetable variety studies being conducted by John D. Downes, Jr., and K. C. Westover at the Morgantown Horticulture Farm.

RADISH: Cavalier, Comet, Cherry Belle, Lone Star. All looked good. Quality excellent.

LETTUCE: Progress, Pennlake, Premier Great Lakes, two strains of Great Lakes. Progress has a slight tendency to burst under high soil moisture and high air temperature conditions; quality good. Pennlake failed to form heads in a great many instances or formed only soft heads

and small ones. Premier Great Lakes, supposedly resistant to tip burn, was mediocre in these trials; it formed many soft, large heads which cracked badly in many cases.

CUCUMBER: Burpee Hybrid, Sunnybrook, Marketeer, A and C. Quality and yields promising.

LIMA BEAN: Triumph, Hendersons. Two "baby lima" varieties. Triumph is a 1949 "All America" winner and considerably better than Hendersons which it is designed to replace. It sets more pods and the beans are plumper, resulting in increased yields. It is also less affected by weather conditions.

SUMMER SQUASH: Caserta, an Italian marrow type squash (selected from Cocozelle by Curtis), is promising from the standpoint of yield and quality. Color is not pleasing. Not readily received on some markets for this reason.

TOMATO: Southland, Clinton Hybrid, Burpee Hybrid, Wisconsin 55, North Dakota 44, and Big Boy.

Southland is fully as good as advertised. Yield, color, shape, quality, and disease resistance quite satisfactory. USDA introduction.

Clinton Hybrid. Probably the best for home gardening.

Burpee Hybrid. Good, but not larger than Clinton Hybrid and Wisconsin 55 or Southland.

Wisconsin 55. Fruits slightly larger than Clinton Hybrid and Burpee Hybrid. Solid and of good color and shape. Free of cracking. Good quality. Some areas report dissatisfaction with this variety.

North Dakota 44. A determinate type adapted primarily to the prairie country, but yielding a large number of rough, pulpy, light-colored, lightweight fruits varying much in size. Only advantage—concentration of early production.

Big Boy. Failed to live up to expectations. Yields disappointing. Size not exceptional.

SWEET CORN: Flagship. "All America" winner in 1949. This variety was not exceptional in our trials except in the large size of the fodder or stalk.

SNAP BEAN: Rival. Good quality. High yielding. Others of even higher quality will be available to gardeners and growers soon.

Hybrid blueberry grows well, tastes good

A cross of cultivated high-bush blueberries and wild, native blueberries that will be easily adapted to the soil of West Virginia, is being sought by W. H. Childs.

By crossing the low-bush and high-bush varieties, he hopes to preserve the flavor of the native low-bush berries and yet produce berries superior to them in size.

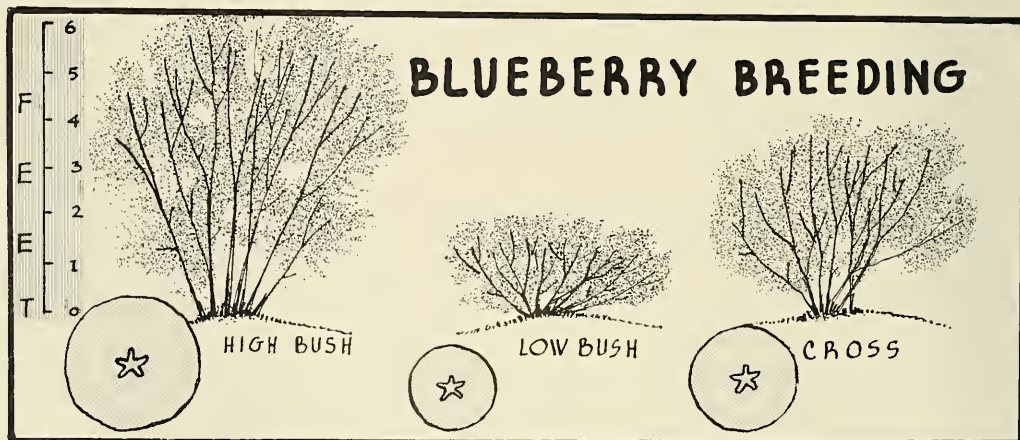
Childs has found that not much soil in the state meets the conditions necessary for cultivated high-bush blueberries. Besides the acidity that all blueberries require, named varieties prefer a sandy soil with considerable organic matter in the surface soil. They also need a water table constantly between 18 and 24 inches from the surface.

One advance in the direction of adaptable soil has been the use

of sphagnum moss. This moss, shredded by rubbing through a screen having two meshes to the inch, gave greater growth than peat and sand, or peat—previously recommended rooting media.

To date, more than 12,000 seedlings have been grown; about 200 of these are being kept for further trial. Some of these seedlings have produced berries about 4/5 of an inch in diameter, and contain much of the fine flavor of the wild, low-bush blueberry.

Birds were a big problem every year until 1949; they like blueberries as well as sweet cherries. In 1949, used tobacco cloth in strips thirty-three feet wide was tried. This worked well. The cost is not out of reason—possibly twenty dollars for a two hundred dollar crop.



Plant Diseases and Insects

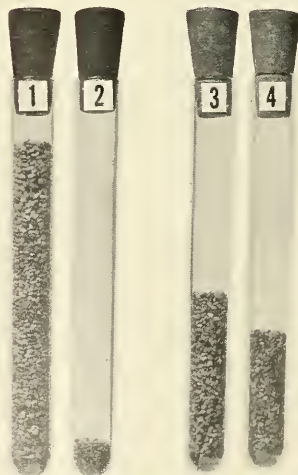


HEALTHY RED CLOVER
heads produce good seeds.



BLACK-PATCH infected
heads contain poor seeds.

It's Black Patch!



RED CLOVER SEEDS. 1: good seeds from 100 heads in a field which had no black patch. 2: shrivelled seeds from same 100 heads. 3: good seeds from 100 heads of black-patch infected plants. 4: shrivelled seeds from same 100 heads.

A FUNGUS DISEASE known as "black patch" is an important cause of clover failure in the South Branch Valley. This finding is an outgrowth of a request by farmers in that region.

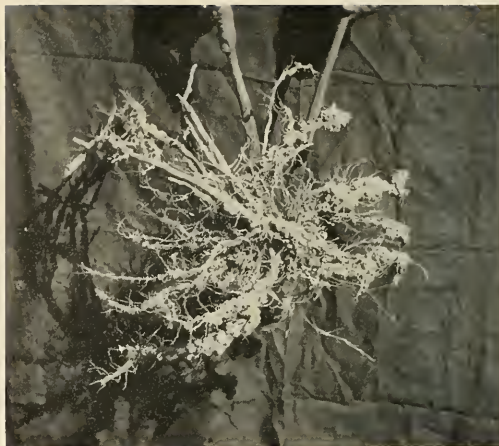
In 1947 they appealed to the Station for help in relation to red clover production. Red clover is important to their crop rotation system. Furthermore, on the gen-

erally accepted theory that locally grown seed performs better than imported seeds, several farmers were encouraged to grow red clover not only for hay but for the seed crop. These farmers found that in some years they could produce a good crop of seed but in other years the seed crop was almost a complete failure. And it was difficult at times

(Continued on Page 20)



ROOTS OF APPLE TREES remain healthy when benzene hexachloride is added to the soil; it controls woolly aphids.



WOOLLY APHIS FORMS GALLS on roots of apple trees in untreated soils. No benzene hexachloride was added here.

Do spray residues affect soil?

ACCUMULATION of residues of spray materials in the soil has long been a matter of interest to the farmer. In fact, many of you often ask, What effect will the continued use of these new sprays have on our soil?

For that reason, Edwin Gould, H. A. Wilson, and J. A. Berardinelli have been conducting research on this problem.

Since World War II, numerous organic spray materials (weed killers, fungicides, and insecticides) have come or are coming into commercial use. Of these, ten were se-

lected by the plant pathologists for this study. To date, most of them appear to have no effect on the total population of soil microorganisms.

Preliminary results of the entomological phase of this study show that some of the insecticides are definitely toxic to certain insects and their relatives in the soil, and may have a direct bearing on their control. For instance, benzene hexachloride has given striking control of the woolly aphid (disease found on roots of apple trees). Other materials may be found to have some similar effect.

to get a good stand of clover even though growing conditions appeared to be favorable.

Under conditions prevailing in the Valley in 1948 and 1949, "black patch" was quite destructive of leaves, stems, flowers, and seeds of red clover. Seed production was reduced considerably more than 50 per cent in some fields. In some cases flower stalks were girdled and the flower heads killed before seeds were formed. In others, the flowers were attacked in all stages of maturity.

The fungus is seed-borne, and when infected seeds are planted, the resulting seedlings are killed by the fungus. Thus the fungus may cause a severe seedling blight, as well as a blight of leaves, stems, and flowers.

The disease is favored by high humidity and grows best at relatively low temperatures. It is probable that the disease may be of major importance only in the mountain valleys where these conditions prevail.

J. G. Leach and E. S. Elliott are conducting extensive studies on possible control by seed treatment and field dusting.

Continuing chestnut research

Work is continuing on the development of a blight resistant native American chestnut.

The periodical cicada hit the plantation hard in June 1948. Hardly a twig escaped punctures.

We gave the trees a heavy pruning following this injury hoping thereby

to reduce the probable blight infection which would be expected to follow. To our surprise no infection of cicada punctures showed up in 1948 while numerous infections appeared on the exposed pruning cuts. In 1949, however, blight appeared quite generally on the cicada injuries even where callus formation was well developed.

C. R. Orton, Roger Pease, and E. H. Tryon say they have no explanation of this delayed infection. These men are conducting the research.

Control of Brooks spot

Brooks spot of apples caused heavy losses in West Virginia in 1949.

Its chief effect is to cause a spotting of the surface of the fruit. Consequently, the apples are graded lower and cause losses in profits.

C. F. Taylor was successful, however, in finding a control for this disease. He says that one application of Bordeaux mixture at 1-2-100 at any time from late May through the first week of July will do the job. Ferbam was slightly less effective.

We also will be doing some more experimenting with other fungicides to test their effectiveness in the control of this disease. At the same time, research will be carried on with sooty blotch and flyspeck.

Insects controlled with sprays

John D. Downes, Jr., has been experimenting in insect control and with various types of spraying equipment.

Two applications of Chlordane—the emulsifiable preparation and the 50 per cent powder—applied as a 5 per cent solution to radishes and cabbage gave complete control of the cabbage maggot. Downes thinks a single application might provide satisfactory control if properly timed.

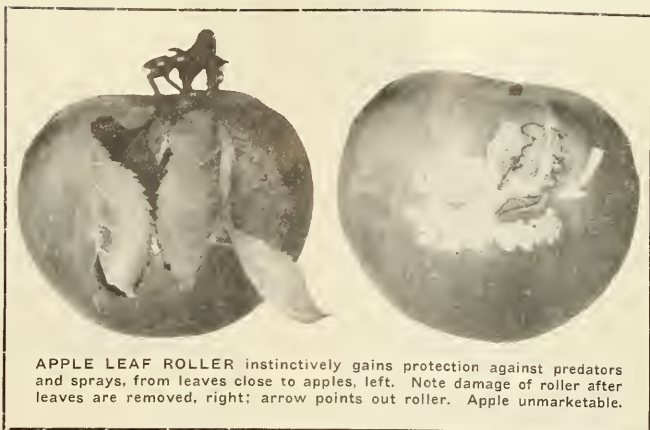
The treatment should be applied for radishes a few days after emergence, and before the true leaves appear; possibly again in a week. Cabbage should be treated a few days after setting the plants.

The experimentation indicated that the emulsifiable form is slightly more effective than the powder form—probably because of the uniform concentration of the poison when diluted for application.

As for spraying equipment, Downes finds conventional hollow cone nozzles, now standard equipment on sprayers, are still preferable to solid cone nozzles. The new solid cone nozzles, if properly designed, have promise. Theoretically, they should give better coverage—particularly on crops with comparatively dense foliage, such as potatoes.

Downes also points out that special nozzles for low quantity application have been perfected for use with the herbicides and insecticides where complete coverage is not essential.

We're testing new insecticides



APPLE LEAF ROLLER instinctively gains protection against predators and sprays, from leaves close to apples, left. Note damage of roller after leaves are removed, right; arrow points out roller. Apple unmarketable.

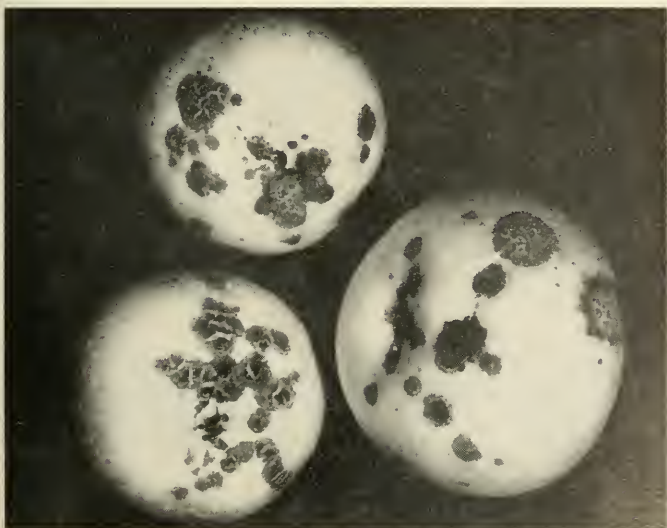
DDT IS ALMOST a perfect material for control of the codling moth, the limiting factor in apple production; however, DDT also apparently kills many other insects, some of these being beneficial forms—parasites and predators. With the elimination of many of their natural enemies, other harmful insects have increased to such great numbers that extensive damage has been done in apple orchards.

The apple leaf roller, mites, and certain scale insects are the most

prevalent of the harmful insects.

To destroy them, special treatment is needed. Rhothane affects the leaf roller. Tests are being made with other insecticides, many of which have a phosphorus base. In some cases these insecticides have been effective against mites and scale insects.

Since the insects mentioned above are a constant menace to West Virginia apple orchards, the Station is continuing this research. Edwin Gould is conducting the work.



APPLE SCAB—CONSTANT THREAT to apple industry—despite better sprays.

An old problem

APPLE SCAB REMAINS the major disease of apples despite a half century of experiments on control.

With the heavier applications by modern machines, such old reliables as liquid lime sulfur cause increasing amounts of injury to the fruit and foliage and must be replaced by effective materials which are less injurious. We have found that such new materials as organic mercurials possess the "burning-out" effects of lime sulfur when applied after infection has occurred, yet are much less injurious to the tree.

When applications can be made before the infection period, C. F. Taylor says that the finely particulate elemental sulfurs or even the ferbams offer adequate protection at a minimum of injury.

New and promising spray materials are tested in experiments each year in the Shenandoah Valley.

New adhesive test methods

(Continued from Page 13)

idle curiosity, but it is not until recent years that a good answer really has been necessary.

New adhesives have introduced into gluing operations a host of heretofore unknown factors which are capable of completely blocking the sticking qualities of the glue.

Since the solution to some of the problems confronting the wood-gluing industries involves greater knowledge of the principles of adhesion, it seems essential that improvements be made in methods of

testing. To this end, George Marra is trying to develop a more sensitive test specimen which would at the same time retain all the advantages of the present standard specimen. This project has been carried now to the point where it appears that a veneered specimen similar to the standard, but differing by having five plies instead of three plies, will be the best compromise that can be made with the stated requirements. Due to better balance, all new specimens register more than twice the strength of the old standard.

Experimentation is being continued.

Excess manganese: bark necrosis

WE HAVE FOUND that applications of neutralizing materials (such as carbonates of lime or magnesium) to acid soils when apple trees are planted will aid in the control of internal bark necrosis.

Internal bark necrosis is primarily a disease of Delicious apple trees. It produces a pimply or bumpy condition of the bark on young growth and progresses on older bark to produce a rough, cracked condition. The trees are stunted, foliage falls prematurely, and if the conditions continue, the trees become unthrifty and eventually die. A thin shaving

of the bark shows a dark brown to black discoloration of the inner bark which often extends into the wood.

Experiments have proved this trouble occurs only where the soil contains available manganese and is quite acid in reaction. Such a condition may be found where the soil is naturally acid or where the addition of spray residues has increased acidity.

Occasionally this disease works severely on Stayman and other varieties, according to Genevieve Clulo and C. R. Orton.



CALLUS FORMATION around fire blight canker that has healed. Five years have passed since it was treated with mercuric chloride, mercuric cyanide.

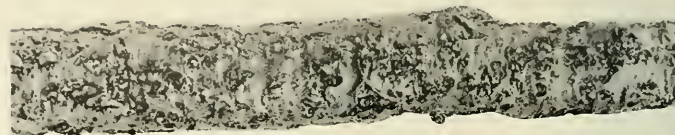
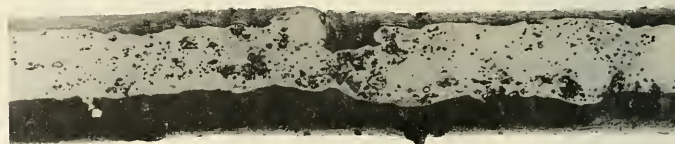
Canker control

THE WILLOW TWIG variety of apples, grown chiefly in the Wellsburg-to-Chester area, is quite susceptible to fire blight. In that section the disease behaves as on the Bartlett pear, developing on trunk and scaffold branches large perennial cankers which eventually girdle the trunk or branch.

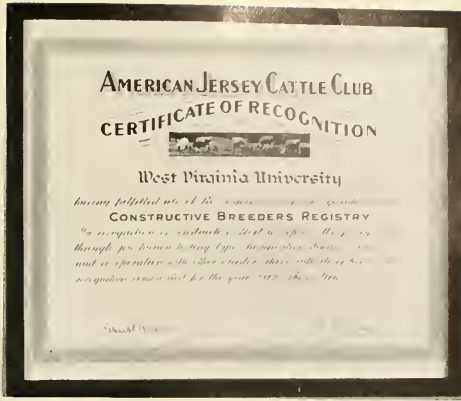
In 1945 a large block of mature Willow Twig trees at Chester was found to be badly injured. That spring we started a project to determine the effectiveness of canker removal as a control measure. Simultaneously the owner began a program of canker removal supplemented by the removal of infected water sprouts during the summer.

As a result, C. F. Taylor says that the disease has been reduced to a minimum and only occasional branches are lost where a young canker is overlooked or where an insufficient amount of the surrounding bark was removed. Large branches from which the cankers were removed in 1945 are still productive.

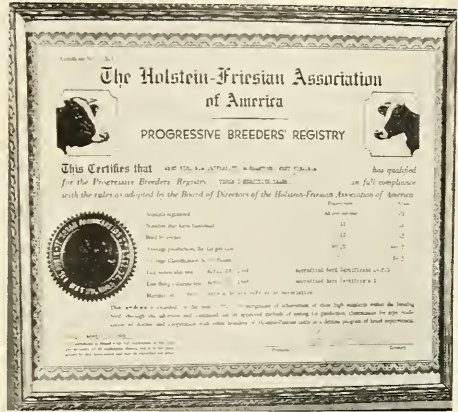
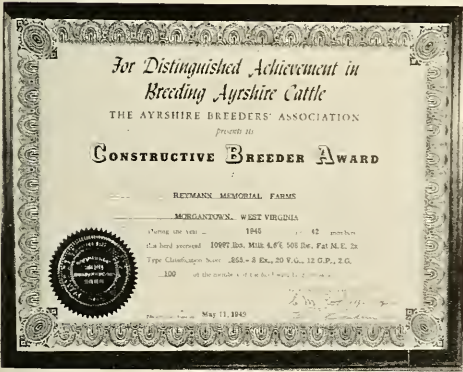
If any of you are interested in this control problem, write to Taylor here at the Agricultural Experiment Station.



GROWTH OF DELICIOUS APPLE TREES is often stunted by internal bark necrosis. Note symptoms. Top, one-year old twigs showing papules, bark ridging. Middle, twigs with slice of outer bark removed, showing dark streaks and pockets of necrotic tissues. Bottom, progressive stage in the development of rough bark.



Dairying



Our dairy herds win acclaim

West Virginia University dairy cattle continue to win national acclaim as they set new production records. In 1949 the Holstein herd surpassed all previous records made in both milk and butter production at the University.

On strictly twice-a-day milking (true of all milking at the W.V.U. Dairy Farm) the Holsteins averaged 12,568 pounds of milk and 510.2 pounds of butterfat with a butterfat test of 4.1 per cent. In 1948 they produced 11,203 pounds of milk and 446 pounds of butterfat.

The herd was classified for type with an average score of 84.7 and won its third and fourth consecutive Progressive Breeders' Award during this biennium. This is the highest award given by the Holstein-Friesian Association. Only 40 breeders in the United States have won this coveted prize four times.

The Reumann Memorial Ayrshire herd did not come up to its 1947-48 production peak of 10,304 pounds of milk and 474 pounds of butterfat (highest ever produced by this herd), but it did qualify for its sixth Constructive Breeders' Award,

given by the Ayrshire Breeders' Association. The Jersey herd also received its fourth Constructive Breeders' Award. This award, the highest honor given to breeders, was presented by the American Jersey Cattle Club.

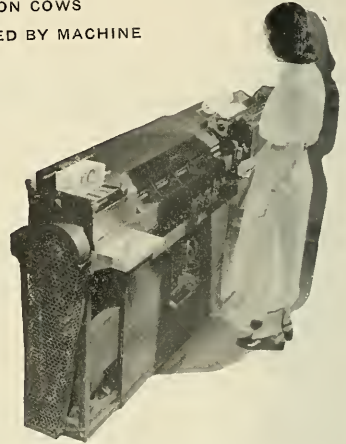
We are proud of all three herds. When you consider that practically all of the 175 animals in the herds are being used on experimental trials and for classroom work, and that many of the practices involved are not conducive to high production, the records of these herds are even more outstanding.

IMPROVEMENT PROGRAM

BASED ON TYPE AND PRODUCTION RECORDS



300,000 RECORDS ON COWS
ARE ANALYZED BY MACHINE



PART OF THIS DIFFERENCE can be accounted for by the shorter lengths of second and third lactations (about 10 days). Another part is due to the fact that most dairymen cull the lowest producers from their herds and keep the highest. The cows whose first records are highest usually have been exposed to the best environment. Some of this better environment may be classified as temporary, that is, it is not repeated in the following lactations. Thus, these highest producing cows are unable to maintain their production at high levels.

Recently, we completed a study of the inheritance of type in dairy cattle. We can predict the type of offspring whose parents have been rated for type. Our findings show that the type of the offspring is estimated to be only 30 per cent as far above or as far below the herd average for type as is the average type of the parents above or below the herd average. Our predictions are based on 2,005 matings.

Milk short when price is high

Dairymen receive a higher price for milk sold during the fall and winter months than during the rest of the year. Yet, farmers produce less milk when they are paid the highest price.

If they produce the smallest amount when the price is highest, there must be a reason. Maybe the extra price doesn't pay for the extra cost they would have if they produced more milk when prices were

high. Maybe many farmers cannot or do not know how to obtain a larger portion of their milk production in the fall.

In order to explain why farmers are not producing more milk when the market pays the highest price, a study was started recently. G. E. Toben, W. W. Armentrout, H. O. Henderson, and George Hyatt are studying records of farmers in West Virginia. They hope to find the major economic factors that influ-

ence the seasonal production of milk. It is hoped that the results will show farmers that changes can be made in their dairying to adjust the seasonal production. Application of the findings also should show farmers whether their present practices are best or whether changes would be more profitable.

In this study, comparisons will be made to show the returns from dairying when different seasonal patterns are followed.

The Comfort Stall

FARMERS WHO WILL use the comfort stall studied here at the Station may realize an increase in milk production valued at approximately \$45 per cow each year.

A stall study, which was started in 1948, is showing extremely encouraging results. Eight large size (48" x 84") comfort stalls were installed in the Holstein barn at the Dairy Farm. These have been used along with seven conventional tie stalls (42" x 56") to obtain records on production, cleanliness, mechanical injury, mastitis incidence, and time spent standing up or lying down for each animal.

The animals in these 15 stalls were paired according to age and lactation period and all production records converted to a mature equivalent basis. The animals were interchanged at the end of the first year from comfort to conventional and vice versa and again at the end of the second year. Any animals that were dropped from the test were replaced by animals of comparable age, size and other factors.

Here are the major results of work done by I. D. Porterfield, A. D. Longhouse, George Hyatt, R. E. Emerson, and Waldo Bell:

1. *Production.* Eight individual comparisons show that the cows while in comfort stalls produced 2 to 12 pounds more milk each day.

2. *Cleanliness.* Results on trials of eight and twelve days show that the cows remained cleaner in the comfort stalls.

3. *Bedding Requirements.* Tests over a 14-day period indicate that tie stalls required 14.1 pounds bed-

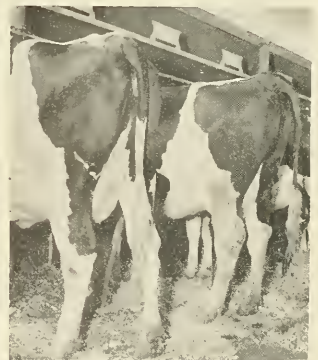
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IT'S EASIER TO REST in the modern comfort stalls. Cows spend approximately one and one-half hours more lying down in comfort stalls than they do in tie chain stalls during a 24-hour period. Additional size, both length and width, are partially responsible for this. Milk production increases; so does income.



NOTE CLEANLINESS of these cows which have been kept in comfort stalls. They lie down inside the board at their hind feet, avoiding dirt in the gutter.



REAR SHANKS of cows in tie chain stalls become dirtier than those of cows in comfort stalls at left. Hind part of cows above is easily exposed to gutter.

What about prepartum milking?

Contrary to information published in agricultural journals, the Station finds no indication that prepartum milking for approximately two weeks before calving either reduces the amount of congestion and swelling or shortens the time required for the udder to become normal following the birth of the calf.

Numbers are still too small to be significant, but thus far the pre-

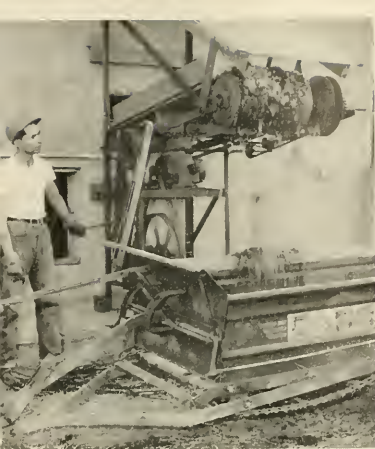
milked animals have averaged somewhat higher in milk production than controls under the same conditions.

No important differences have been noted in length of gestation, birth weight of calves, or retention of placenta between the groups.

Most authorities in the past have agreed that calves can not be raised successfully unless they receive colostrum. By feeding extra cod liver

oil for the first two days after birth, however, calves from our prepartum milked dams have made satisfactory growth even when the dams were giving apparently normal milk at the time of the birth of the calf.

This project is being conducted by R. A. Ackerman, A. H. Van-Landingham, George Hyatt, H. O. Henderson, C. E. Weakley, and C. A. Flanders. Our prepartum milking project is in its fourth year.



EASIER--AND CHEAPER

TIME AND MONEY have been saved by the installation of a mechanical gutter cleaner at our Dairy Farm. Both of these items were kept in mind as our Agricultural Engineering and Dairy staffs developed the cleaner.

The type of cleaner constructed will cost approximately \$400 as compared to \$1500 for a commercial type of comparable size. Our cleaner also has the advantage of easy installation.

As for saving time, the present cleaner can remove manure and litter from a 75-foot gutter in approximately one minute. Time and motion studies have shown that a saving of about 47 minutes each day can be realized in cleaning the 40-cow Ayrshire barn at the W.V.U. Farm.

If you are interested in structural plans of this cleaner, built by D. P. Brown, A. D. Longhouse, and George Hyatt, write to the Station.

A caution on thyroprotein

Thyroprotein (or protomone) has been found to cause an increase in milk and butterfat production for a period of several weeks. It is important for you dairymen, however, to know that results do not show that this material will cause any increase in production over an entire lactation period. In other words, the cows seem to spurt for a while and then drop off more rapidly towards the end of their lactation. In all these experiments, which have been in progress at the Station for several years, this material has been

fed at the rate of 15 to 20 grams a day in addition to a regular dairy ration.

When milk and butterfat production are increased for a time, the heart rate and respiration rate are speeded up and there is a marked decrease in body weight. Some cows lose as much as 150 to 200 pounds in a period of six to eight weeks. University researchers say that the reproductive processes are slowed up and they feel that these stimulants are still in the developmental stage.

Most West Virginia dairymen can increase their dairy production by better feeding and management practices. That is the opinion of A. H. VanLandingham, George Hyatt, J. H. Hare, C. E. Weakley, H. O. Henderson, and N. O. Olson.

Protomone now is sold under a commercial trade name.

We want to remind dairymen throughout the state to be careful in the use of any thyroprotein. Do not overfeed it, nor should it be fed to cows on production tests because breed associations will not accept any tests made when a stimulant is used.

How to maintain milk supply

Delivery either every other day or three times a week is enough for pasteurized milk of good quality, provided the distributor and consumer use reasonable care in handling the product. This is a finding of S. J. Weese and H. O. Henderson.

They found that good quality milk would retain its best flavor for three or four days after delivery, but after the fourth day there is a decided drop in flavor and an increase in acidity and bacteria count.

Their study indicates a need for consumer education. The public must be taught to refrigerate milk promptly upon receipt and to place the cap back on a bottle after part of the milk is used.

Beware of pedigree poppycock

A lot of work is being done on the transmission of milk and butterfat production and body conformation by dairy sires at the Station by George Hyatt, W. J. Tyler and H. O. Henderson.

Early studies of the Reymann Memorial Ayrshire herd helped jump the average butterfat of 301 pounds in 1922 to approximately 450 pounds in 1947. This was accomplished mainly through the continuous use of outstanding proved bulls.

SINCE PROVED BULLS are expensive and are limited now pretty much to artificial breeding rings, it has become increasingly important to learn what we need to look for in the pedigree of a young bull.

Research in the Reymann herd indicates that the sire of the young bull must be well proved and his dam's records must be unselected. The records of his dam's daughters are important to know, too, as well as the type of his nearest relatives. The breeder should also beware of "pedigree poppycock," sometimes known as filler, which is misleading.

IN ADDITION to these findings, a careful study of cow families shows that there are considerable differences between families in body weight, breeding efficiency, milk production, butterfat test, and type. Even though the differences found were not statistically significant, certain families do breed back more regularly and are also more resistant to mastitis than other cow families.

MUCH LIGHT has been thrown on the matter of proper selection of young and old bulls through this research, but many more years of experimentation are necessary to solve numerous problems which still exist.

It might also be mentioned that the Reymann herd has been classified for type for over 10 years now and there is more information at this Station on type classification than at any other station in the country. Dairy staff members working on the project are trying to find through a further breakdown of the type classification scorecard just which faults are heritable and which ones are not.

Intermarket milk pricing

James H. Clark is working on a project concerned with intermarket pricing of milk. Attempts are being made to discover price differentials between markets. These findings will point out areas which can most economically furnish milk supplies to the various consuming centers.

Clarke also is working on a project dealing with seasonal variation in milk supplies. He hopes that the results will help producers in shifting production from one season to another to meet variation in supplies and uses. Furthermore, findings should indicate how much more milk that dealers will need to bring into the markets from outside normal supply areas.

CATTLE SHEEP AND HOGS



THIS BOOK HAS BECOME a standard reference work for researchers in the field of animal nutrition. In compiling the volume, our Station staff used about 900 references, including 11,000 digestion trials. Foreign studies are included.

Is growth rate of lambs related to their birth weight?



THESE TWO HAMPSHIRE EWE LAMBS follow the trend in the Station's project on the relation of lamb birth weight to rate of growth. When this photograph was taken, the No. 1 lamb (left) was 77 days old, the No. 2 lamb 73 days. No. 1, which had weighed 8 pounds at birth, weighed 65-1/2 pounds. From 10-1/2 pounds at birth, No. 2 had grown to 69 pounds, though 4 days younger than No. 1.

An interesting lamb project is being carried on by C. V. Wilson. He is checking lamb birth weights and their relation to rate of growth.

Substantial data are available to show significant differences in rate of growth in favor of the lambs with heavier than average birth weights.

The data were obtained from trials in which purebred Corriedale, Cheviot, Hampshire, Shropshire, and Southdown rams were used on native grade Hampshire type ewes.

Since the dams of the lambs were not purebred and were not of the same breeding as the rams, it appeared highly probable that a more accurate appraisal of the difference in rate of growth attributed to birth weight could be made by using the purebred lambs grown annually in the four Station flocks.

Enough information has been obtained on these lambs to show defi-



NATIVE GRADE HAMPSHIREs before and after clipping. Produce less wool and fewer lambs than Corriedales. Have depth in body, short legs, and black face.

Corriedale ewes outproduce Hampshires

Two flocks of 65 head (each) of yearling ewes at Wardensville have been under study. One is made up of western grade Corriedales and the other of native grade Hampshires.

E. A. Livesay and C. J. Cunningham have been seeking the comparative incomes of the two types when kept under the same feeding and management.

After six years of research, they find that the Corriedale ewes pro-

duce 17.6 per cent more pounds of lamb, on a per ewe bred basis, than the Hampshire ewes. The Corriedales also produce 48 per cent more pounds of wool on a ewe-clipped basis.

The average gross income showed a difference of \$6.38 per year in favor of the western grade Corriedale ewes. The average grade of lambs at the market was equal for each type of ewe.



WESTERN GRADE CORRIEDALES before and after clipping. Note difference in size with sheep above. Have rangier bodies with long legs. Also white-faced.

nite trends. It appears that the heavier than average lamb at birth within a breed made faster gains and weighed more at 140 days of age than the lighter than average lambs at birth. This trend is true for single rams, single ewes, twin rams, and twin ewes.

Additional data eventually will permit a highly accurate estimate of the growth rate differences due to birth weight within breeds and a comparison between the four breeds.

Grass-legume silage good, cheap

Experimental work conducted with grass-legume silage for the past six years definitely has shown it to be an excellent roughage for beef cattle of all ages.

Here at Morgantown grass-legume silage has been compared with corn silage, oat silage, and mixed hay (alfalfa, timothy) as a roughage for fattening two-year-old steers. In all cases the comparison has shown grass-legume silage to be one of the good and one of the cheapest roughages. Grass-legume silage also has been compared with oat silage and mixed hay (clover, alfalfa, timothy) for wintering bred cows and yearling steers with similar results.

At Wardensville grass-legume silage has been compared with corn silage for wintering beef cows over a period of five years. The results show slightly heavier winter gains were made by the lot fed corn silage, but calves produced by the lot fed grass-legume silage were equal in all respects to the calves produced by the cows fed corn silage. The development of the cows (starting as yearling—plus heifers) in the two lots was almost equal over the five-year period.

All comparisons in these studies were made on an equal dry matter basis.

E. A. Livesay, C. J. Cunningham, and A. H. VanLandingham have devoted a lot of time to this project.

Thyroid stimulants uneconomical

Can a market hog be produced more quickly and more economically by thyroid treatments than can be produced under normal conditions?

The answer is *no* according to R. H. Black and E. A. Livesay.

From their experimental data, it appears that farmers can produce pork as cheaply on adequate diets as can be produced with the addition of stimulants and depressants.



BROILER HOUSE, REYMANN MEMORIAL FARMS, HEATED WITH HOT AIR FROM CENTRAL LOCATION.



Poultry

Sulfa results good

PRELIMINARY WORK conducted by N. O. Olson and T. B. Clark here at the University farm and by C. J. Cunningham at the Reymann Memorial Farms shows that chicks fed sulfaquinoxaline to prevent coccidiosis made better gains than those not fed the drug. The drug was fed continuously at a rate of one-quarter pound per ton of mash and no serious losses from coccidiosis occurred in any lots.

More work is being done by J. K. Bletner, C. E. Weakley, A. H. Van-Landingham, and Clark on the effect of sulfaquinoxaline on growth and feed efficiency.

Sulfaquinoxaline fed at levels of one-eighth pound per ton in a high fiber ration, one-fourth pound per ton in high, medium, and low fiber rations, and one pound per ton in

high and medium fiber rations did not affect growth of the chicks from the second to the sixth week of age. The differences obtained in pounds of feed consumed per pound of gain in weight were due to the mash mixtures and not the drug.

A specially designed house at the Reymann Memorial Farms is the scene of more recent experiments. Using 950 broilers per pen at the beginning, the effects of sulfaquinoxaline and a nitrophenide are being studied as prophylactics against coccidiosis. When either drug was fed continuously at the rate of one-fourth pound per ton of mash, better growth was obtained to twelve weeks of age than when no drug was fed.

Results tend to point out that increased growth and better feed ef-

ficiency resulting from the feeding of the drugs to broilers on the floor has not been due to a growth stimulant, but rather to the control of the coccidia organism.

J. O. Heishman is helping with experimentation at the Wardenville substation.

Broilers—mortality rate

Mortality or death loss is one of the most important factors related to broiler production costs. This is a finding of the Station in a recent study conducted in Grant, Hardy, and Pendleton counties.

J. H. Clarke states that high mortality was associated with high production costs and low mortality with low production costs.

Coccidiosis causes greater mortality than any other disease.



POOR FEATHERING, SMALL BODY resulted from experimental ration of 70 per cent soybean oil meal.



35 PER CENT SOYBEAN oil meal ration fed this bird. Left photo, Vitamin B12 didn't correct feathering condition.

Good feathering, breast

SINCE BROILER PRODUCTION has become a dominant part of the poultry industry in West Virginia, T. B. Clark and C. J. Cunningham are looking for a broiler with superior market qualities.

A part of their breeding program has been directed toward finding efficient methods of selecting for the desired market qualities.

Selections have been made each year from New Hampshire progeny out of both multiple and single-male matings. Compared with an unselected flock within the same strain, the physical selection of those birds above average for the flock has effected an improvement in feathering and plumpness of breast. This physical selection has had little effect on body weight to date. Progress in the other qualities has been slow, but the method is simple and less expensive than trapnesting and progeny testing.

Results to date show that selection for the broiler qualities has affected neither egg production nor egg size.

The results from crossing Barred and White Rocks with New Hampshires did not result in any improvement over the selected New Hampshires. Crossing the dark and White Cornish with the New Hampshires always brought about an improvement in plumpness of breast but growth rate frequently was retarded.



WEST VIRGINIA CHICKEN BREAST METER measures width of bird's breast in degrees. It is taken at the anterior point of the keel in the twelfth week. The meter was developed by the Station in cooperation with the State Department of Agriculture. Will be available in near future.

Improving turkey reproduction

A project on the improvement of reproductive performance in turkeys is being carried on by T. B. Clark and J. K. Bletner.

The effects of selection methods and different degrees of inbreeding on hatchability (percentage of fertile eggs that hatch) in the Station's flock are being studied.

You will hear more about this.

Egg marketing is important

Eggs have become an increasingly important subject of research at the Station. In fact, three egg projects are underway. Their titles are: "The Effect of Consumer Choice on Egg Marketing," "Techniques for Measuring Consumers' Choice," and "Marketing West Virginia Eggs."

One of these studies shows that consumers are not much interested in buying eggs by bulk weight. In one store in Morgantown, eggs have been offered for sale by the pound (from bulk, self-service) for almost a year. In this trial, the customer has put the eggs (any number) in paper bags and taken them to the meat counter to have them weighed.

No more people are using this method now than when it was first started. Such sales amount to only about 6 per cent of the eggs sold.

Another weight method seems more acceptable—that is, putting

(Continued on Page 33)

Crooked keel: heredity, environment

SOME RECORDS are available now on our project concerning keel deformities of chickens. (W.V.U. White Leghorn flock).

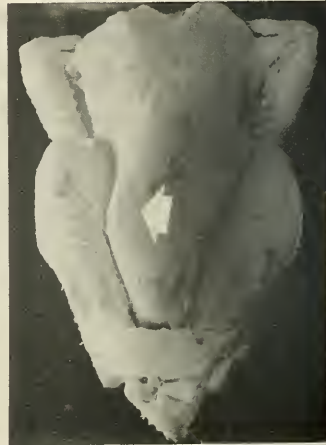
As we all know, carcasses of chickens with deformed keels are placed in lower market grades. Consequently, it was deemed advisable to determine the cause of crooked keels.

H. M. Hyre, who is in charge of the work, is making a study of the effect of both heredity and environment on keel condition. The chicks from each hen were divided into two lots. One lot had access to

perches during the brooding period. The other was brooded without perches.

The first year's results show that the birds which were brooded without perches had normal keels and that 19 per cent of the chicks that had access to perches during the brooding period had deformed keels. There also was a wide variation in keel condition among the progeny which had access to perches.

Hyre recommends that chickens having a tendency for deformed keels should not be given access to perches during the brooding period.



Special Topics

Grain conveyor eliminates labor

Initial studies here indicate that it may be possible to convey feed and grain several hundred feet through pipe. If so, it will mean real labor-saving and timesaving.

A. D. Longhouse has already made some exploratory tests with equipment from the U. S. Department of Interior and the Engineering Experiment Station. The method used in the tests seemed practical.

The system appears to be working

well when whole wheat is blown through a one-inch pipe for a distance of 100 feet—that is, with a minimum of five pounds air pressure.

The conveyor currently moves grain at the rate of one ton per hour.

Business place in farm homes

The Station is making a farm housing survey in cooperation with other stations in the Northeast Region. Two-thirds of all farm

families interviewed in the Region indicated that they wanted either an office or a desk for business operations. It seemed appropriate, therefore, to investigate the requirements in location, space, and type of equipment which would likely prove satisfactory for carrying on the business of the farm and home.

Some trial arrangements are being set up, and some farm families who have business centers in operation are to be visited.

University scientists are studying nutrition of students in northeastern survey

OUR NUTRITIONAL SURVEY is in its third year. It is being conducted by A. H. VanLandingham, Sam Stregesky, Faith Wolfe, and J. J. Lawless, M.D.

They have been keeping records of students here on campus while other stations in the Northeast Region are studying junior high and high school students, industrial workers, and pregnant women and their offspring. When the program ends two years from now, the Station should be able to point out any deficiencies which appear in college students' diets. The study also might show up deficiencies in the diets of citizens throughout the state.

In addition, the survey will help to prove or disprove methods being used by the University experimenters.

No conclusive results are available at present, but there are a few early trends. Data collected seem to indicate that girls may be slightly lower in blood hemoglobin than boys. On the other hand, blood ascorbic acid values of girls are higher than those of boys. In general, diets tend to be low in vitamin A, calcium, and phosphorus; yet few physical signs of nutritional deficiencies have been detected.

Additional work must be done during the next two years before definite conclusions can be drawn.



RECORD KEEPING IS IMPORTANT to nutrition surveys. Student's daily record is being checked here by a researcher. Data must be kept accurately.



BLOOD SPECIMEN is being taken from this student. It will be analyzed micro-chemically for hemoglobin, Vitamin A, carotene, ascorbic acid content.



PHYSICAL EXAMINATIONS are conducted at the University Health Center to detect signs of nutritional deficiencies in the eyes, skin, mouth, gums.



FEMALE RATS DROP YOUNG in cages like one shown in insert, same as the top four rows of cages. Bottom, mating cages. Both types used for ration study.

Rats help our biochemists find answers on nutrition problems

SINCE NUTRITIONAL requirements of rats, farm animals, and human beings are similar in many respects, our staff has been doing a lot of work with rats.

Two years ago we reported that rations composed of the whole grain cereals (corn, wheat, oats) and soybean meal, supplemented with riboflavin, steamed bone meal, sodium chloride, manganese sulphate, and cod liver oil, were adequate for good lactation and growth of young rats. The well-known B-vitamins as additional supplements also are of little value.

Our research, however, does seem to indicate that dried liver, liver concentrates, and animal protein

concentrates contain the necessary factor for satisfactory growth, reproduction, and lactation. It also looks as though these materials contain appreciable quantities of what is known as the "animal protein factors" which are needed for good lactation and growth of the rats.

Furthermore, it appears that the new Vitamin B₁₂ used by doctors in the treatment of pernicious anemia in humans may be the unknown factor required to supplement the all-plant basal rations in order to obtain good lactation and growth of the young.

A. H. VanLandingham, C. E. Weakley, Jr., and Robert Barrickman are carrying on this work.

Veterinary medicine

Chickens submitted to our Animal Pathology laboratory for diagnosis indicate a market increase in the respiratory diseases, especially Newcastle and infectious coryza.

With the help of Extension poultrymen we have found Newcastle disease in twenty-six of the fifty-five counties of West Virginia. N. O. Olson has found also that mortality due to this disease decreases with age as shown by the following figures: one to four weeks, 66.8 per cent died; four to eight weeks, 35.8

per cent died; nine to sixteen weeks, 17.9 per cent died; and hens, 8.3 per cent died.

In another experiment, streptomycin was found effective in treating infectious sinusitis in one flock of turkeys. The streptomycin was not effective, however, when cheesy material had developed in the sinuses.

Preliminary trials on the use of gonadotropic hormones of pregnant mare serum indicate that it is beneficial in some cases of reproductive disturbances, particularly when the ovaries are in a quiescent stage.

George Lambert has done some research which shows that vitamins A and C are not significant factors in breeding efficiency in our dairy herds.

Farm ponds increase income

Fish in farm ponds are fast becoming a supplemental meat supply for West Virginia farmers. Under average farm conditions you can produce at least 100 to 150 pounds of fish per acre each year. This will require from 600 to 1000 pounds of fertilizer per acre—in other words, you put in about 20-25 cents worth of fertilizer for each pound of fish you catch.

Franklin Dugan says there is another obvious advantage. For those who like to fish, such ponds furnish a number of pleasant afternoons during the summer months.

There are over 3,000 farm ponds in West Virginia today with a total area of more than 1,200 acres. They have a potential annual production of approximately 75 tons of fish.

These ponds are used also for erosion control, storage of drinking water for livestock, provision of spray water for orchards and truck gardens, fire control, supplying water for farm buildings, swimming, boating, ice skating, and even baptisms.

School club vs Nonschool club

Some interesting factors have come out of a study on 4-H club organization. The project was designed to study the relationship of types of organization and 4-H club work.

Nonschool clubs seem to have longer organizational life, meet more frequently in homes, have more and longer club meetings, use year-round resident leaders more frequently, have community projects, and usually have active adult councils. In addition, these clubs have higher re-

It is hoped that on the basis of this investigation of business centers it will be possible to make recommendations to interested families. These recommendations are likely to concern kinds of furniture and/or equipment to purchase, how to arrange space for business activities in old or remodeled houses, or how to make proper provision for such activities in a new house.

Ruth D. Nocr, Martha Plonk, Maxine Wittebort, Gladys Wasmuth, Gertrude Humphreys, and A. D. Longhouse have a part in this research.

enrollment rates, greater average length of membership, smaller average size, high rates of county camp attendance, and proportionately more older members.

School clubs, on the other hand, are generally larger and are more frequently supervised by male teacher-leaders.

These results are based on data collected in fifty counties, including a concentrated survey of 220 clubs in eleven counties, according to W. F. Porter, Jr.

This research is being carried on in cooperation with the Agricultural Extension Division. Other results will be announced later.

Check decrease of game

A project is now underway, under the direction of Maurice Brooks and Franklin Dugan, to determine what steps compatible with good land use might be taken to check the decrease of game and, if possible, to increase the supply of wildlife.

According to estimates of the State Conservation Commission, 70 per cent of all hunting in the state is done on farm lands. Therefore, special attention has been given to farm game species—particularly cottontail rabbits and bobwhite quail—and their natural enemies.

Cooperators have been encouraged to carry on standard wildlife practices such as: planting game-food borders, spot planting conifers for winter cover, sowing game-food patches, providing game lanes, and constructing farm ponds.

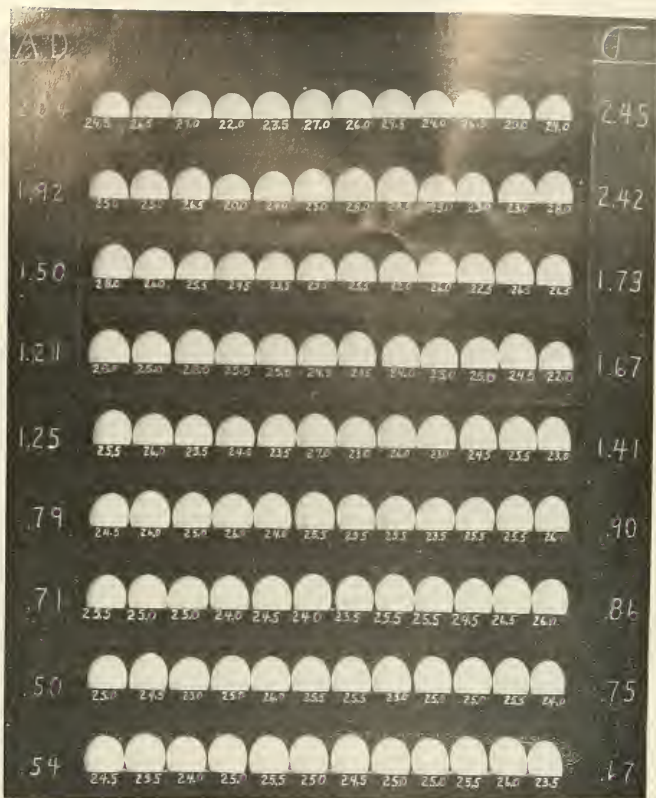
Results of this investigation should be available in the near future.

Digestibility of feeds, rations

C. A. Flanders is engaged in experimentation that some day may help us to predict the digestibility and utilization of nitrogen-free extracts of feeds and rations.

Nitrogen-free extract and crude fiber combined make up the carbohydrates which supply the greater portion of energy in animal feeds.

The digestibility of carbohydrates by animals is dependent upon the type of animal and the proportion of such materials as starches, sugars, cellulose, hemicellulose, and lignin. The starches and sugars are almost completely digested; the cellulose, hemicellulose, and lignin are not. The hemicellulose from some sources is utilized more than from others.



UNIFORM SIZING OF EGGS is being studied here. Researchers want to know if it is profitable to egg producers to size their eggs. Each row of 12 eggs, above, averages 25 ounces per dozen. Bottom three rows would qualify under U.S. Consumer Grade as "Large." Although other six dozen average the same weight, some individual eggs are too small to make "Large." So, they grade lower. Sizes vary.

Egg marketing is busy research field for station economists

(Continued from Page 30)

eggs in cartons and labeling the weight on them. In the summer of 1949, when egg prices were quite high, there was a marked tendency for the eggs lighter in weight to sell ahead of heavier eggs.

This research also seems to point out that retailers have poorly established sources of egg supply during hot weather. In fact, about 40 per cent of all stores surveyed were out of eggs at the time of the visit. The reasons offered most often for not having eggs were: (1) no great effort is made to obtain eggs. (2) eggs

are not good at this time of year, and (3) adequate facilities are not available to handle them.

In about half of the stores visited in the summer of 1949, eggs were graded to determine what quality consumers are able to get in retail establishments during hot weather. Despite adverse weather conditions and what appeared often to be questionable handling practices, about 70 per cent of the eggs were still of high quality—either grade "A" or "AA."

Norman Nybroten, W. W. Armentrout, and H. C. Evans have been working on this project. Nybroten is also the leader of a merchandising and egg deterioration study in the Northeast Region.

Hemicelluloses from several different plants are being isolated and studied chemically.

Hillculture research points the way to extra income from our native products



MAPLE SYRUP

NATIVE HOLLY

THROUGH RESEARCH in hillculture, the Station has helped a number of farmers throughout the state increase their incomes. A walnut meat pasteurizer has been developed to help increase the commercial production of walnuts; a good method for packing sprays of holly has been worked out; and a way was found to prevent mold in maple syrup.

The holly is dipped in a specially prepared emulsion and packed in an airtight container that will keep it fresh ten days to two weeks.

Before the Station found a method for preventing mold in the syrup, commercial sales were not practical. The new development increased the price one dollar on the gallon, according to Roger Pease.



Does one vitamin affect another?

Is the critical level of one vitamin affected by the level of intake of another vitamin? That is a problem that Marion Wharton, A. H. Van-Landingham, and Faith Wolle have been experimenting on.

They say their research seems to show that the requirements of ascorbic acid are not affected by the level of thiamine intake, or vice versa, in the metabolism of the guinea pig. This may be true with humans.

Walnut meat pasteurizer

During the past year the walnut meat pasteurizer at Heaters, West Virginia, has needed only minor repairs. The neoprene belts deteriorated under prolonged exposure to the imposed high heat and humidity and had to be replaced.

Complete plans for the construc-

tion of the pasteurizer have been developed by R. E. Emerson and R. W. Pease and are available through the Agricultural Engineering department of the Station.

Holly grows best in the open

The most efficient production of holly for the Christmas market may be met by growing it in the open—that is, in a position where plenty of sunlight can be absorbed. Our experimental results prove this.

The investigation showed, however, that trees grown in shade have larger leaves with a better lustre; the leaves also have a better general appearance. But this appearance can not compensate for the scarcity of leaves produced. Open grown holly produces much larger crowns and more leaves.

This research was done by R. W. Pease and E. H. Tryon.

Cows do better in comfort stall

(Continued from Page 25)

ding per day for each stall, and the comfort stall required 16.2 pounds per day.

4. *Time Required to Clean Stall.* No significant difference exists.

5. *Injuries.* Ten were sustained by eight cows in the comfort stalls and 29 by seven cows in the tie stalls.

6. *Time Spent Lying Down.* Over a period of 19 days, seven cows in the tie stalls spent an average of 8.8 hr./24 hr. lying down. Seven cows in comfort stalls spent an average of 10.2 hr./24 hr. lying down.

Tygart Valley tract

In September 1949 the University acquired a 495-acre forest tract to be

Financial Statement for the year July 1, 1949, to June 30, 1950

CLASSIFICATION OF RECEIPTS AND DISBURSEMENTS	HATCH	ADAMS	PURNELL	BANKSHAD-JONES	RESEARCH & MARKETING			NON-FEDERAL FUNDS	TOTAL
					951-2	953	Title II		
RECEIPTS									
Received from the Treasurer of the U. S.	\$15,000.00	\$15,000.00	\$60,000.00	\$65,169.05	\$71,672.80	\$21,800.00	\$2,500.00	.....	\$251,141.85
State appropriations	.....	.....	.....	.....	.....	.....	.....	\$139,380.00	139,380.00
Main station .....	.....	.....	.....	.....	.....	.....	.....	76,150.00	76,150.00
Substations .....	.....	.....	.....	.....	.....	.....	.....	118,802.00	118,802.00
Special .....	.....	.....	.....	.....	.....	.....	.....	3,282.20	3,282.20
Special grants, etc. ....	.....	.....	.....	.....	.....	.....	.....	126,115.47	126,115.47
Sales .....	.....	.....	.....	.....	.....	.....	.....	52,106.56	75,214.45
Balances forward .....	.....	.....	.....	.....	20,612.44	2,495.45	.....	.....	.....
TOTAL RECEIPTS	\$15,000.00	\$15,000.00	\$60,000.00	\$65,169.05	\$92,285.24	\$24,295.45	\$2,500.00	\$515,836.23	\$790,085.97
DISBURSEMENTS									
Personal services	\$12,297.32	\$13,175.00	\$49,893.02	\$54,361.66	\$46,076.56	\$7,299.40	\$2,500.00	\$153,885.40	\$339,488.36
Travel	12.88	.....	.....	1,794.52	2,199.69	2,669.60	.....	5,261.01	11,937.70
Transportation of things .....	.....	.....	504.87	.....	.....	425.96	.....	513.35	1,444.18
Communication service .....	.....	.....	.....	.....	20.04	.....	.....	746.85	766.89
Rents and utility services	846.55	.....	1,110.94	1,193.88	35.86	.....	.....	9,350.52	12,537.75
Printing and binding	457.67	.....	461.64	106.39	25.00	12.79	.....	2,014.23	3,077.72
Other contractual services	214.98	27.00	697.07	196.66	1,236.05	44.88	.....	32,777.21	35,193.85
Supplies and materials	97.01	1,273.22	5,081.26	5,333.93	3,165.62	1,180.55	.....	81,191.04	97,322.63
Equipment	1,073.59	524.78	2,251.20	2,182.01	6,281.82	3,075.18	.....	61,961.96	77,350.54
Lands and structures (contr.) .....	.....	.....	.....	.....	.....	.....	.....	40,909.76	40,909.76
TOTAL DISBURSEMENTS	\$15,000.00	\$15,000.00	\$60,000.00	\$65,169.05	\$59,040.64	\$14,708.36	\$2,500.00	\$388,611.33	\$620,029.38
UNEXPENDED BALANCES .....	.....	.....	.....	.....	33,244.60	9,587.09	.....	127,224.90	170,056.59

Personnel Changes

C. R. Orton, Dean of the College of Agriculture, Forestry and Home Economics, and Director of the Agricultural Experiment Station since 1938, resigned June 30, 1949, to become professor of plant pathology and Station plant pathologist. F. D. Cornell, Jr., Assistant Director of the Station, served as Acting Dean and Director until February 28, 1950. H. R. Varney

used for educational and research work in Forestry. The area is located in the Tygart Valley at Dailey, about nine miles south of Elkins. It will be useful for studying problems of forest production and utilization.

Plans have been prepared to determine the present conditions of the forest. With this information, research will be planned to develop and demonstrate forest management practices.

became Dean and Director on March 1, 1950.

New appointments within our research staff during the two-year period 1948-1950 include E. R. Baker, Jr., assistant in agricultural engineering; N. M. Bangham, assistant in agronomy; Ronald Bird, cooperative agent for the Bureau of Agricultural Economics; D. P. Brown, assistant agricultural engineer; O. J. Burger, assistant agronomist; H. C. Evans, assistant agricultural economist; C. B. Gregory, assistant bacteriologist; M. E. Gallegly, Jr., assistant plant pathologist; A. W. Goodspeed, forester; R. O. Gustafson, associate forester; J. H. Hare, assistant agricultural biochemist; J. O. Heishman, associate animal pathologist, Reymann Memorial Farms; R. L. Henrickson, assistant animal husbandman; J. B. Huffman, assistant forester; George Lambert, assistant animal pathologist; E. D. Matthews, soil scientist; C. W. Neal, assistant in genetics; F. J. Nisbet, assistant ornamental horticulturist; Norman Nybrotten, agricultural economist; Martha A. Plonk, assistant in housing research; Mary Alice Ryan, assistant in bacteriology; O. E. Schubert, assistant horticulturist; J. F. Silbaugh, editor; G. H. Stewart, assistant editor; Sam Stregovsky, assistant agricultural biochemist; A. H.

Thompson, horticulturist (Kearneysville); R. P. True, associate plant pathologist; Faith J. Wolfe, research assistant in nutrition.

Promotions include J. L. Cartledge, geneticist; Genevieve B. Clulo, associate plant pathologist; C. J. Cunningham, associate animal husbandman in charge, Reymann Memorial Farm; Torkel Holsoe, forester; V. G. Lilly, physiologist; F. W. Schaller, associate agronomist; W. J. Tyler, dairy husbandman; E. H. Tyner, agronomist; A. H. VanLandingham, biochemist and head of the Department of Agricultural Biochemistry.

During the same period the following have resigned; R. B. Dustman, who relinquished his duties as head of the Department of Agricultural Biochemistry to accept the position as Dean of the Graduate School; Gerald Jenny, editor; George Lambert, assistant animal pathologist; E. D. Matthews, soil scientist; Mary Alice Ryan, assistant in bacteriology; F. W. Schaller, associate agronomist; B. H. Schneider, animal husbandman; R. H. Suds, associate horticulturist; E. H. Tyner, agronomist.

John C. Johnston, Chief Clerk, and member of the College and Station staff for thirty-five years, died in May 1949.

Publications of Biennium

Bulletins

327. (Revised) R. M. Smith, G. G. Pohlman, F. W. Schaller, D. R. Browning, and C. J. Cunningham. Pastures Improved with Tillage, Treatment, Seed. June 1950.
333. Lowell Besley. Taxation of Forest Lands in West Virginia. November 1948.
334. C. R. Orton. Research Powers the Farm. December 1948.
335. J. E. Mason and W. W. Armentrout. Inventory of Public Lands in West Virginia. April 1949.
336. J. H. Rietz and C. V. Wilson. Mass Feeding of Salt and Phenothiazine to Breeding Ewes and Market Lambs. May 1949.
337. T. C. McLivaine and G. G. Pohlman. Crop Growth and Soil Reaction. May 1949.
338. J. H. Clarke. The Broiler Industry in West Virginia. May 1949.
339. George Hyatt, Jr., W. J. Tyler, and H. O. Henderson. More Milk Through Better Breeding. June 1949. Reprinted November 1949 and June 1950.
340. T. B. Clark, A. H. VanLandingham, and C. E. Weakley, Jr. Young Grass-legume Silage in the Poultry Ration. September 1949.
341. Torkel Holroe. Profitable Tree Forms of Yellowpoplar. June 1950.

Circulars

64. (Revised) W. H. Childs. Strawberries for West Virginia Farms. May 1950.

Mimeographed Circulars

60. J. L. Cartledge, E. H. Tyler, R. J. Friant, and B. M. Ritter. Results of Hybrid Corn Yield and Fertilizer Trials in West Virginia for 1948. February 1949.
61. F. W. Schaller. Weed Killers vs. Cultivation in 1948. April 1949.
62. A. D. Longhouse. Electric Hay Hoists. April 1949.
63. Collins Veatch. Weed Control and Corn Yields in 1949. February 1950.
64. J. L. Cartledge, E. H. Tyler, R. J. Friant, C. W. Neal, and W. B. Johnson. Results of Hybrid Corn Yield and Fertilizer Trials in West Virginia, 1949. February 1950.
65. Collins Veatch. Chemical Weed Control Recommendations for 1950. March 1950.

Scientific Papers

370. C. F. Taylor. Benefits from the control of leaf spot on sour cherry. *Proc. of W. Va. Acad. of Sci.* 19 (1947): 19-22. In *W. Va. Univ. Bul.* ser. 49, no. 9-1. February 1949.
371. H. L. Barnett and V. G. Lilly. The production of haploid and diploid fruit bodies of *Lenzites trabea* in culture. *Proc. of W. Va. Acad. of Sci.* 19 (1947): 34-39. In *W. Va. Univ. Bul.* ser. 49, no. 8-1. February 1949.
372. V. G. Lilly and H. L. Barnett. Growth rates and vitamin deficiencies of various fungi. *Proc. of W. Va. Acad. of Sci.* 19 (1947): 27-33. In *W. Va. Univ. Bul.* ser. 49, no. 8-1. February 1949.

375. Genevieve Chulo and Anthony Berg. The distribution of boron in the tissue of the apple tree. *Proc. of W. Va. Acad. of Sci.* 19 (1947): 43-49. In *W. Va. Univ. Bul.* ser. 49, no. 8-1. February 1949.

379. H. D. Erickson. Relation of specific gravity to shrinkage and of these factors to growth in yellowpoplar. *Journal of Agricultural Research.* 78, nos. 5 and 6: 103-127. March 1 and 15, 1949.

386. V. G. Lilly and H. L. Barnett. The inheritance of partial thiamin deficiency in *Lenzites trabea*. *Journ. of Agri. Res.* 77: 287-300. December 1948.

387. S. L. Galpin. Overburden of the Pittsburgh coal in West Virginia. *W. Va. Coal Mining Inst. Proc.* 182-186. 1947-48.

388. A. H. VanLandingham and P. B. Lyon. Further observations on the inadequacy of rations containing whole-grain cereals supplemented with soybean oil for lactation and growth of young rats. *W. Va. Acad. of Sci. Proc.* 20 (1948): 90-95. In *W. Va. Univ. Bul.* ser. 49, no. 9-2. March 1949.

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391. E. S. Elliott. The effect of vitamins on the growth of some graminicolous species of *Helminthosporium* and *Fusarium*. *W. Va. Acad. of Sci. Proc.* 20 (1948): 65-68. In *W. Va. Univ. Bul.* ser. 49, no. 9-2. March 1949.

392. V. G. Lilly and H. L. Barnett. Growth rates, vitamin deficiencies, and Sclerotia formation by some *Sclerotiniaceae*. *W. Va. Acad. of Sci. Proc.* 20 (1948): 69-74. In *W. Va. Univ. Bul.* ser. 49, no. 9-2. March 1949.

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394. H. W. Thurston, Jr., J. G. Leach, and J. D. Wilson. Chromates as potato fungicides. *Amer. Potato Jour.* 25: 406-409. November 1948.

395. G. R. Gist and R. M. Smith. A comparison of the root development of several erosion-resistant grasses on one soil type in relation to the nature of the soil profile. *Jour. Amer. Soc. Agron.* 40, no. 11: 1036-1042. November 1948.

396. T. B. Clark, J. K. Bletner, and A. H. VanLandingham. Soybean oil meal, solvent and hydraulic cottonseed meals in chick diets. *Poult. Sci.* 27, no. 5: 644-646. 1949.

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400. Edwin Gould and E. O. Hamstead. Control of the red-banded leaf roller. *Jour. of Econ. Ent.* 41, no. 6: 887-890. December 1948.

401. T. B. Clark, A. H. VanLandingham, and C. E. Weakley, Jr. Soybean oil meal in poultry rations. *Poult. Sci.* 28, no. 4: 521-529. July 1949.

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403. A. H. VanLandingham, C. E. Weakley, Jr., R. A. Ackerman, and George Hyatt, Jr. The relationship of production of heifers milked prepartum to the composition of colostrum. *Jour. of Dairy Sci.* 32, no. 6: 559-564. June 1949.

404. S. Elliott. The effect of the sugar concentration on conidial size of some species of *Helminthosporium*. *Phytopath.* 39: 953-958. December 1949.

405. H. L. Barnett and V. G. Lilly. The influence of nutritional and environmental factors on asexual reproduction of *Chaetomium convolutum*. *Phytopath.* 40: 80-89. January 1950.

406. R. S. Mathur, H. L. Barnett, and V. G. Lilly. Sporulation of *Colletotrichum lindemuthianum* in culture. *Phytopath.* 40: 104-114. January 1950.

410. H. O. Henderson and S. J. Weese. The keeping quality of pasteurized milk in home refrigerators. *Jour. of Dairy Sci.* 32: 945-949. November 1949.

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413. N. Nybrotten. Using students in a state university for a pilot study when designing a sample for a state survey. *Agri. Econ. Research.* 11-2: 20-22. January 1950.

415. W. E. Washbon and W. J. Tyler. The number of proved sons necessary to evaluate the transmitting ability of a dairy sire. *Jour. of Dairy Sci.* 33, no. 5: 293-299. May 1950.

422. C. F. Taylor. Brooks' spot and sooty blotch of apple. *The Mountaineer Grower.* 20, no. 181: 3-7. March 1950.

Projects of Biennium

(Continued from Page 4)

Entomology

- Relation of temperature and other physical factors to insects (A 1)
Biological and mechanical control of codling moth (BJ 1); coop. USDA)
Miscellaneous insect and insecticide studies (S 21)
Biology and control of insects of major importance in commercial orchards in W. Va. (P 9)
Toxicity of cumulative spray residues in soil (RM 18); coop. Plant Pathology, Agronomy, USDA)

Forestry

- Forest taxation in W. Va. (EJ 29)
Management of far-n fish ponds in W. Va. (BJ 4); coop. W. Va. Conservation Comm.)
Mobile circular sawmill for farm woodlots in W. Va. (BJ 44)
Efficient forest management practices for

W. Va. cut-over and burned over hardwood forest lands (BJ 49)
 Animal repellents on hardwood forest plantations (BJ 56)
 Profitable tree forms (S 37)
 Improvement of farm game and wildlife conditions on the soil conservation district (S 42)
 Production, development, and marketing of hillculture products in W. Va. (S 49)
 Plantings of forest trees and shrubs at Greenland Gap (S 56)
 Determination of optimum growth of W. Va. hardwoods (S 60)
 Use of chemicals for eradication of trees and bushes (RM 12)
 Test specimens for wood adhesives (RM 16)
 Management of forest land for sustained-yield, mine timber production (RM 19; coop. Forest Products Association)

Home Economics

Preserving vegetables and small fruits by freezing (S 55)
 Space, facilities, and structural requirements for activities relating to the business of the farm and home in W. Va. (RM 27 [NE 7]; coop. Agr'l Engineering, Agricultural Extension Service)

Horticulture

Improvement of potato varieties for W. Va. (A 11; coop. Plant Pathology)
 Selection, breeding and propagation of the low-bush blueberry *vacinium vacillans* (BJ 12)
 Effect of cultural practices and orchard soil management on soil moisture and availability of plant nutrients, particularly potassium, to fruit trees (BJ 16; coop. Agronomy)
 Miscellaneous horticultural investigations (S 27)

Variety tests of tree and small fruits (S 29)
 Variety and strain studies of vegetables (S 31)
 Lily bulb production trials (S 61; coop. USDA)
 Improvement of fruit tree rootstocks (P 16; coop. USDA)

Plant Pathology

Effect of environment upon growth, reproduction and parasitism in fungi and bacteria (A 6)
 Anatomical and histological changes in diseased plants (A 10)
 Nutrition of fungi and bacteria with especial reference to substances which induce, stimulate, or inhibit growth and reproduction (BJ 2)
 Spray injury and fungicidal efficiency of orchard sprays as influenced by the weather (BJ 6)
 Testing new fungicides with particular reference to their application to potatoes and vegetable crops (BJ 32)
 Forest tree diseases (S 18-11; coop. Forestry, Horticulture)
 Miscellaneous plant disease investigations (S 19)
 Apple measles (P 19)
 Black rootrot of apple (P 21)
 Control of loose smuts of wheat and barley through centralized hot-water seed treatment (P 40; coop. Agr'l Engineering, Agronomy)
 Microbiology of strip mine seepage water in relation to plant growth and soil conditions (P 53; coop. Agronomy)

Staff of Station

June 30, 1950

ADMINISTRATION

Irvin Stewart, LL.B., Ph.D., LL.D., President of the University
 H. R. Varney, Ph.D., Dean and Director
 F. D. Cornell, Jr., Ph.D., Asst. Director

AGRONOMY AND GENETICS

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 N. M. Baughman, B.S., Asst. in Agron.
 D. R. Browning, M.A., Asst. Agron.
 J. L. Cartledge, Ph.D., Gen.
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 B. J. Patton, A.B., Soil Sci.
 B. M. Ritter, B.S.Agr., Asst. in Agron.
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 J. K. Bletner, B.S., Asst. Poultr. Husb.
 T. B. Clark, M.S., Assoc. Poultr. Husb.
 C. J. Cunningham, B.S.Agr., Asst. in An. Husb.
 R. L. Henrickson, M.S., Asst. An. Husb.
 H. M. Hyre, M.S., Assoc. Poultr. Husb.
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 N. O. Olson, D.V.M., An. Path.
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 C. V. Wilson, M.S., An. Husb.

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 Robert Barrickman, M.A., Tech. Aid, Agr. Biochem.
 C. A. Flanders, M.A., Asst. Biochem.
 J. H. Hare, Ph.D., Asst. Biochem.
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 George Hyatt, Jr., M.S., Dairy Husb.
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 S. J. Wesse, M.A., Asst. Dairy Husb.

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 Ronald Bird, M.S., Coop. Agent, Bur. of Agr. Econ.
 J. H. Clark, M.S.Agr., Assoc. Agr. Econ.
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 Norman Nybroten, Ph.D., Agr. Econ.
 W. F. Porter, Jr., A.B., Asst. Rural Sociol.
 G. E. Toben, M.S., Assoc. in Farm Mgt.

ENTOMOLOGY

L. M. Pears, Ph.D., Entomol.
 Edwin Gould, B.S.Agr., Entomol.

ENGINEERING (AGRICULTURAL)

A. D. Longhouse, Ph.D., Agr. Eng.
 E. R. Baker, Jr., B.S.E.E., Asst. in Agr. Eng.
 D. P. Brown, M.S., Asst. Agr. Eng.
 R. E. Emerson, M.S., Asst. Agr. Eng.

FORESTRY

W. C. Percival, Ph.D., For.

Decay as a factor in sprout reproduction of yellowpoplar (P 54; coop. Forestry)
 Storage and market diseases of tree fruits (RM 13)

Cause of and remedy for red clover failures in W. Va. (RM 14)

M. C. Brooks, M.S., For.
 J. B. Byers, B.S.E., Asst. For.
 R. E. Dugan, M.F., Asst. For.
 V. W. Goodspeed, M.F., Asst. For.
 R. O. Gustafson, M.F., Assoc. For.
 Lorlek Holsoe, M.F., For.
 J. B. Huffman, M.F., Asst. in For.
 G. V. Longacre, B.S.E., Res. Asst. in For.
 G. C. Marra, D.F., Assoc. For.
 Rudolph Markus, Ph.D., Visit. Res. Asst. in For.
 C. A. Myers, M.F., Asst. in For.
 E. H. Tyrone, Ph.D., Assoc. For.

HOME ECONOMICS

Gertrude McAllister, M.S., Res. Asst. in Foods
 Faith Wolfe, M.S., Res. Asst. in Nutrition
 Martha Plonk, M.S., Res. Asst. in Housing

HORTICULTURE

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 W. H. Childs, Ph.D., Assoc. Hort.
 J. D. Downes, Jr., B.S.Agr., Asst. in Hort.
 A. P. Dye, M.S.Agr., Asst. Hort.
 F. J. Nisbet, Ph.D., Asst. Orn. Hort.
 R. W. Pease, B.S., Asst. Hillcul.
 O. E. Schubert, Ph.D., Asst. Hort.
 A. H. Thompson, Ph.D., Hort.
 K. C. Westover, Ph.D., Hort.

PLANT PATHOLOGY AND BACTERIOLOGY

J. G. Leach, Ph.D., Plant Path.
 H. L. Barnett, Ph.D., Mycol.
 Genevieve Chulo, M.A., Assoc. Plant Path.
 M. E. Gallegly, Jr., Ph.D., Asst. Plant Path.
 V. G. Lilly, Ph.D., Physiol.
 C. R. Orton, Ph.D., Plant Path.
 Mary Alice Ryan, M.S., Asst. in Bact.
 C. F. Taylor, Ph.D., Plant Path.
 R. P. True, Ph.D., Assoc. Plant Path.
 H. A. Wilson, Ph.D., Assoc. Bact.

MISCELLANEOUS

D. R. Creel, Photog.
 J. F. Silbaugh, B.S.J., Editor
 G. H. Stewart, M.A., Asst. Editor
 Martha Traxler, Chief Clerk

C. R. Orton Retires

(Continued from Page 1)

He initiated a series of conferences on "low-income farm families" which finally resulted in a research program called "Hillculture." From the development of this project, some farm families have graduated from the public assistance group to the self-sufficient group.

Not only was Dr. Orton responsible for a wide expansion of the Station, and the College of Agriculture (as Dean), but he also received a number of individual honors for his work. He was starred in *American Men of Science* as one of the leading scientists in the United States, has been president of the American Phytopathological Society, and is a charter member of Mycological Society of America.

In addition, Dr. Orton served on a number of important committees in the University, State, and Nation.

His record stands as a tribute to his name.

Come and See

FIELD DAYS provide an excellent opportunity for farmers to see a practical demonstration of research at work. Many of the research projects of the Station are placed "on review."

These field days are not restricted to one phase of agriculture or to one section of the state. They are held at various University experimental farms around West Virginia. Among the subjects covered are soils, grains, livestock, dairy cattle, poultry, plant diseases, entomology, fruits, and vegetables.

Furthermore, field days give the researcher and the farmer a chance to become better acquainted. Opportunities are provided to gain understanding of each other's problems.



A-SHAPED SHELTERS are shown at new poultry farm



RESEARCHERS point out diseases on potatoes



MODERN EQUIPMENT cuts silage on experimental farm

NEW IRRIGATION SYSTEM installed for experiment at dairy farm should provide water for pasture during dry spells



